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# Interstate – 94 Exit 161 Operational Analysis Bismarck, ND

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Final Report

November 2009

Prepared for:  
North Dakota Department of Transportation

Prepared by:  
Advanced Traffic Analysis Center  
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## ***ENGINEERING CERTIFICATION***

This document was  
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I hereby certify that this report was prepared by me or under my direct supervision and that I am a duly registered professional engineer under the laws of the State of North Dakota.

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November 19, 2009  
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## 1.0 BACKGROUND/OVERVIEW

Over the past several years, Bismarck, ND, has seen a significant amount of development primarily in the north and east portions of the city. As a result of the growth, several roadways have experienced an increase in vehicular traffic. One such roadway, Centennial Road/Bismarck Expressway, has experienced a growth in traffic volume due to several residential developments to the north of Interstate 94 (I-94), and industrial/commercial developments to the south of I-94. In addition, Centennial Road acts as a bypass for traffic traveling to/from the northern part of the city. The increased traffic volume has created operational issues in the vicinity of the Centennial Road/Bismarck Expressway and I-94 Interchange (Exit 161). Moreover, the increased traffic volume along the corridor has made the approaches of Trenton Drive experience significant delays during periods of peak traffic. The North Dakota Department of Transportation (NDDOT) contracted the Advanced Traffic Analysis Center (ATAC) to evaluate various traffic control and geometric alternatives to reduce congestion along the corridor for both the near-term and long-term planning horizons. This analysis will focus on five intersections along Centennial Road/Bismarck Expressway between Century Avenue and Divide Avenue (Figure 1).

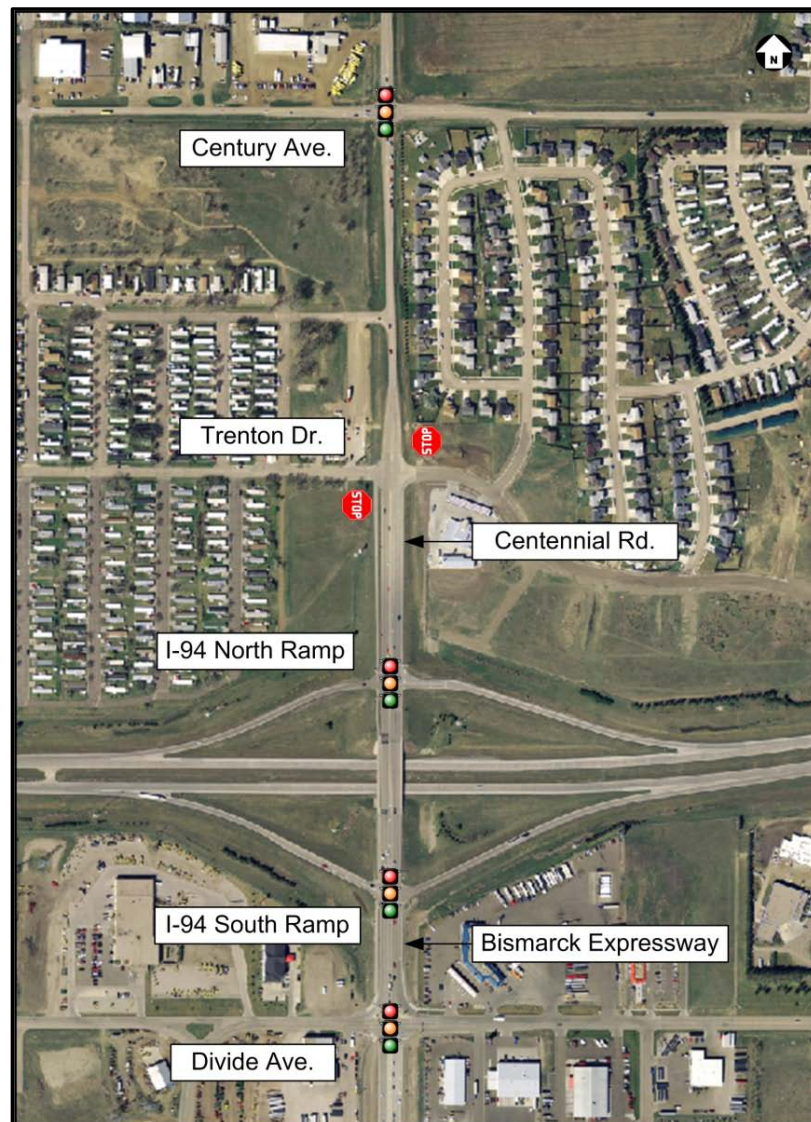


Figure 1. Study area with existing intersection control

## **2.0 OBJECTIVES**

This study will evaluate the operational performance near the vicinity of the Centennial Rd/Bismarck Expy and I-94 Interchange. Various traffic control and geometric design alternatives will be evaluated using the existing conditions, as well as several planning horizons. The analyses will provide guidance on selecting the most appropriate geometric configuration and traffic control for the short- and long-term planning horizons. The recommendations of this study will primarily focus on the Centennial Rd/Bismarck Expy and the I-94 Interchange.

## **3.0 ANALYSIS OVERVIEW**

This study consists of both transportation planning and traffic operations activities. To get a better understanding of the corridor's future traffic volume, the Bismarck-Mandan Metropolitan Planning Organization's (MPO) regional travel demand model (TDM) will be used, which is an existing Citilab's Cube model. The operational analyses will be conducted using Trafficware's Synchro software program, which is a software program used for analyzing/optimizing traffic signal timing and performing capacity analyses.

This study will analyze the peak-hour conditions of 2009 (base year), as well as several future planning horizons, which include 2024 (15-year forecast), 2035 (26-year forecast), and 2059 (50-year forecast). The study's steering committee, which consists of representatives from the NDDOT, City of Bismarck, and the Bismarck-Mandan MPO, will be used to determine the appropriate roadway network and future level of development east of Exit 161. While the operational activities will focus on the five intersections shown in Figure 1, the planning-level study area encompasses a much larger area, which includes the Centennial Rd/Bismarck Expy corridor from 48<sup>th</sup> Ave. S. to 71<sup>st</sup> Ave. N. (7 miles) and east to 80<sup>th</sup> St. E. (3 miles). The larger planning area is used to account for additional development that will influence the traffic volume along Centennial Rd/Bismarck Expy, as well as adjacent roadways.

The TDM's average daily traffic (ADT) estimates and trends will be incorporated into the Synchro model, which will also include various combinations of traffic control and geometric modifications. These analyses will provide several measures of effectiveness (MOE), including network delay, intersection level of service (LOS), and queue length.

## **4.0 ANALYSIS SCENARIOS**

In terms of the TDM's network geometry, the 2024 scenario will include the existing geometry and proposed improvements that are planned and programmed according to the Bismarck-Mandan MPO's Transportation Improvement Plan (TIP). The 2035 and 2059 scenarios are based on some of the alternatives being evaluated as part Bismarck-Mandan MPO's 2035 Long-Range Transportation Plan. The long-term networks include the existing and committed transportation projects, as well as an interchange at 66<sup>th</sup> St. E. (2 miles east of Centennial Rd/Bismarck Expy), which will be connected to the north with 71<sup>st</sup> Ave. N. and to the south with Main Ave. and 48<sup>th</sup> Ave. S. The 66<sup>th</sup> St. E. Interchange will serve as a bypass that may improve the traffic operations of the Centennial Rd/Bismarck Expy. The scenarios that will be evaluated in this study are as follows:

### **Base Year (2009)**

- Existing conditions: current traffic control and geometric conditions (AM Peak)
- Existing conditions: current traffic control and geometric conditions (PM Peak)
- Optimized control: optimized timing plans with current control and geometry (AM Peak)
- Optimized control: optimized timing plans with current control and geometry (PM Peak)
- Signal at Trenton Dr. (AM Peak)
- Signal at Trenton Dr. (PM Peak)

### **15-Year Forecast (2024)**

- Existing traffic control and geometric conditions (AM Peak)
- Existing traffic control and geometric conditions (PM Peak)
- Signal at Trenton Dr. (AM Peak)
- Signal at Trenton Dr. (PM Peak)
- Signal at Trenton Dr. and NE Loop Ramp (AM Peak)
- Signal at Trenton Dr. and NE Loop Ramp (PM Peak)

### **26-Year Forecast (2035 TDM Forecast)**

- Existing traffic control and geometric conditions (AM Peak)
- Existing traffic control and geometric conditions (PM Peak)
- Signal at Trenton Dr. (AM Peak)
- Signal at Trenton Dr. (PM Peak)
- Signal at Trenton Dr. and NE Loop Ramp (AM Peak)
- Signal at Trenton Dr. and NE Loop Ramp (PM Peak)
- Signal at Trenton Dr. and NE/SW Loop Ramp (AM Peak)
- Signal at Trenton Dr. and NE/SW Loop Ramp (PM Peak)

### **50-Year Forecast (2059)**

- Existing traffic control and geometric conditions (AM Peak)
- Existing traffic control and geometric conditions (PM Peak)
- Signal at Trenton Dr. (AM Peak)
- Signal at Trenton Dr. (PM Peak)
- Signal at Trenton Dr. and NE Loop Ramp (AM Peak)
- Signal at Trenton Dr. and NE Loop Ramp (PM Peak)
- Signal at Trenton Dr. and NE/SW Loop Ramp (AM Peak)
- Signal at Trenton Dr. and NE/SW Loop Ramp (PM Peak)
- Signal at Trenton Dr. and NE Loop Ramp with a 6-Lane Corridor (AM Peak)
- Signal at Trenton Dr. and NE Loop Ramp with a 6-Lane Corridor (PM Peak)

Note: The two 6-lane scenarios were performed due to congestion that developed with the 4-lane corridor.

## **5.0 TRAFFIC VOLUME DATA**

Traffic counts were obtained from the City of Bismarck for the intersections of Century Ave. & Centennial Rd, Trenton Dr. & Centennial Rd, Bismarck Expy & I-94 North Ramp, Bismarck Expy & I-94 South Ramp, and Bismarck Expy & Divide Ave. The AM and PM peak-hour volumes were obtained from the count data and were used as a basis of comparison for the other scenarios. The AM peak-hour occurred from 7:15 a.m. to 8:15 a.m., while the PM peak-hour occurred from 4:45 p.m. to 5:45 p.m.

The traffic volume projections for the future planning horizons were calculated using the Bismarck-Mandan MPO's TDM. The long-range scenario of the TDM represents the 2035 planning horizon. These scenarios include the transportation network and socio-economic projects (household and employment data), which were provided by the MPO. The ADT data from the 2035 model will be compared to those from the 2007 scenario, which is the calibrated base year of the planning model, to determine an annual growth factor (note Appendix A for ADT information). The corresponding growth factor on each link in the network will be used to determine the volume increase over the existing peak-hour traffic (Figures 2-3). The resulting growth factors will be applied to the links of the 2024 and 2035 scenarios.



Figure 2. AM Peak Hour Volumes and Growth Factors



Figure 3. PM Peak Hour Volumes and Growth Factors

To obtain 2059 traffic volume estimates, the full build-out information for the planning level analysis area will be provided by the Bismarck-Mandan MPO and incorporated into the TDM. Note that the full build-out information does not represent a specific planning horizon and may not ever be realized; however, it will allow us to estimate the current level of development and will be used to determine potential future levels of development.

The household and employment growth rates of the study area's traffic analysis zones (TAZ) between the 2007 and 2035 planning horizons will be used to estimate the 2059 development. The 2007 planning horizon represents 14% and 4% of the study area's full build-out households and jobs, respectively (Table 1). Based on the 2035 socio-economic projections, these percentages increase to 37% (households) and 23% (jobs) of the full build-out scenario. This level of growth (simple interest) averages 0.8% per year for households and 0.7% for jobs between 2007 and 2035 (shown in Appendix B). To maintain a similar growth trend, the 2059 scenario will include an additional 25% of the available households and jobs to the 2035 data, which are not fully developed by 2035. This process provides an average annual growth of 0.8% (households) and 1.0% (jobs) between 2035 and 2059. Therefore, the 2059 scenario would represent 57% (households) and 47% (jobs) of the study area's full build-out scenario.

Table 1. Full Build-out and Growth Rates for 2007, 2035, and 2059 Planning Horizons.

| Planning Horizon | Households<br>(% of Full Build-out) | Total Jobs<br>(% of Full Build-out) | Household<br>(Avg. growth/yr.) | Total Jobs<br>(Avg. growth/yr.) |
|------------------|-------------------------------------|-------------------------------------|--------------------------------|---------------------------------|
| 2007             | 14%                                 | 4%                                  | -                              | -                               |
| 2035             | 37%                                 | 23%                                 | 0.8%                           | 0.7%                            |
| 2059             | 57%                                 | 47%                                 | 0.8%                           | 1.0%                            |

## 6.0 OPERATIONAL ANALYSIS

A Synchro network will be created for each of the 30 scenarios, which includes the corresponding traffic volumes and geometric attributes. The optimized timing plans incorporated a 100-second cycle length and the phase split and offset optimization will focus on reducing intersection and network delay. Roadway reconstruction is scheduled in 2010 for Centennial Rd, which will widen the roadway from Trenton Dr. north to Saratoga Rd. These changes will be reflected in the 2024 Synchro networks to provide an accurate basis of comparison.

To provide a realistic representation of future changes to the network, the 2035 and 2059 scenarios will incorporate a significant amount of geometric enhancements to account for the increased traffic volumes. The primary modifications will include changing Century Ave. to a four-lane facility, and adding turning lanes at intersections where turning volumes are significant. In addition, left-turn lanes will be added when the corresponding volumes exceeded 100 vehicles/hour and dual left-turn lanes will be added when volumes exceeded 300 vehicles/hour (e.g., westbound left-turn movement at Century Ave. and eastbound left-turn movement at the I-94 South Ramp). Note that the side-street geometry of the Divide Ave. and Bismarck Expy Intersection will remain unchanged for this analysis.

## 7.0 ANALYSIS RESULTS

The Centennial Rd/Bismarck Expy (Exit 161) corridor at I-94 was analyzed to evaluate improvements to the intersections adjacent to the interchange, and to evaluate potential impacts on the interchange ramps/intersections. A total of five intersections were analyzed for each of the scenarios, with proposed changes ranging from optimizing existing signal timings to extensive geometric enhancements (note Appendix C for details). Note that, although modifications (such as a signal) may be proposed at an intersection, this study took a systems

approach for evaluating the operations of the facility rather than a detailed study of each individual intersection. Before a signal is installed at an intersection, signal warrants must be met based on the current conditions, or those of the near future. This section will discuss each of the scenarios, and will provide some insight as to how proposed changes impact the corridor.

Based on discussion with the steering committee, a future interchange at 66<sup>th</sup> St. E. on Centennial Rd/Bismarck Expy would be implemented by 2035. To illustrate the traffic impacts on Centennial Rd/Bismarck Expy, the 2035 TDM was run with and without the 66<sup>th</sup> St. Interchange. When the 66<sup>th</sup> St. Interchange is not included into the network, traffic volume along Centennial Rd/Bismarck Expy increases, particularly for the westbound movement at the north ramp and the eastbound movement at the south ramp, which are 56% and 14% higher, respectively for the 2035 planning horizon (Table 2). Since the 66<sup>th</sup> St. Interchange will be 2 miles east of Centennial Rd/Bismarck Expy, the corridor will not experience a significant change in traffic volume with the additional interchange.

Table 2. 2035 Network Volume Comparison (vehicles per day)

| Approach                                   | 2035 with 66 <sup>th</sup> St. E. Interchange | 2035 without 66 <sup>th</sup> St. E. Interchange |
|--------------------------------------------|-----------------------------------------------|--------------------------------------------------|
| <b>Bismarck Expy &amp; I-94 North Ramp</b> |                                               |                                                  |
| Westbound                                  | 2,354                                         | 3,674                                            |
| Southbound                                 | 13,680                                        | 13,902                                           |
| Northbound                                 | 16,914                                        | 17,574                                           |
| <b>Bismarck Expy &amp; I-94 South Ramp</b> |                                               |                                                  |
| Eastbound                                  | 7,736                                         | 8,824                                            |
| Southbound                                 | 13,620                                        | 14,346                                           |
| Northbound                                 | 18,279                                        | 19,191                                           |

Under the existing two-way stop control at Trenton Dr., a significant amount of delay was incurred by the vehicles attempting to turn onto Centennial Rd/Bismarck Expy, which contributes to the network delay. Due to the significant volume on Centennial Rd, the capacity calculation for the side-streets is shown to be zero in Synchro and the Highway Capacity Manual (HCM). Therefore, Synchro's methodology for calculating the delay with this condition is to assign the movement a delay of 9,999 seconds per vehicle. So, the delay of 9,999 seconds is multiplied by the number of vehicles at that approach. Although the approximated value for delay is exaggerated, a high value is used because the delay cannot be defined. The network delay reflects this calculation, which is why there is such a large discrepancy between the unsignalized and signalized scenarios. Based on the provided turning movement counts, some capacity exists for Trenton Dr. during the peak periods. Reasons for this may include more north/south gaps existing in the field, side-street traffic accepts significantly smaller gaps, etc. The addition of a signal will likely increase the network delay due to impacting vehicles on the major street. However, the current values reflect the severity of the current situation at the intersection of Trenton Dr & Centennial Rd. The overestimated network delay values are noted in Tables 3-6.

## 7.1 Base Year (2009)

Existing conditions along the Exit 161 corridor are considerably worse for the AM peak, which has a network delay of 1,104 hours compared with 511 hours of delay for the PM peak (Table 3). Optimizing the signals along the corridor yields a slight reduction in network delay for the AM peak and a slight increase in network delay for the PM peak.

The intersection of Century Ave. and Centennial Rd is experiencing a LOS of “F” during the AM Peak (Table 3). The two critical movements at this intersection are the southbound through movement and the westbound left-turn movement. The existing westbound left-turn volume at this intersection is approximately 500 vehicles during the AM peak. In addition, both Century Ave. and Centennial Rd are 2-lane facilities, which limit the capacity of the intersection. The PM peak period at this intersection is currently operating with a LOS of “C,” with the critical movements being the northbound and southbound through movements.

The intersection of Trenton Dr. and Centennial Rd currently operates as a two-way stop, which has vehicles on Trenton Dr. yielding to those on Centennial Rd. The two-way stop control creates significant delay and the operational analysis returns an error due to the calculated value exceeding the limitations of Synchro (Table 3). Note that incorporating signalized control at this intersection greatly reduces the overall network delay. Although a signal improves the intersection operations, the LOS was reported to be an “F,” so further geometric enhancements will be needed. In addition, the calculated queue lengths for a signalized intersection should not have negative effects on the I-94 North Ramp due to potential spillback (as long as reasonable signal timing values are used).

The I-94 North Ramp currently experiences a LOS of “F” during the AM peak and a “B” during the PM peak (Table 3). The critical movements for this intersection are the northbound left-turn and the southbound through during the AM peak, and the northbound through and northbound left during the PM peak. Optimizing the current network improves the LOS from a “F” to a “D,” as does the addition of a signal at Trenton Dr. The operations during the PM peak showed an improvement from a LOS “B” to an “A” with the optimization and addition of a signal at Trenton Dr.

The I-94 South Ramp currently has a LOS of “C” during the AM peak and a LOS of “B” during the PM peak (Table 3). Optimizing the current timings improves the AM peak LOS to a “B.” However, no significant changes were observed at this intersection when a signal was implemented at Trenton Dr.

The intersection of Divide Ave. and Bismarck Expy is operating with a LOS of “B” for both the AM and PM peak hours. It should be noted that neither optimizing the current timings nor the addition of a signal at Trenton Dr. and Centennial Rd had any significant impact on this intersection, which continued to operate at a LOS of “B” (Table 3). The complete intersection inputs and outputs for the 2009 scenarios are provided in Appendices D – I.

Table 3. 2009 Synchro Output

| Scenario                                                      | AM Peak           |                           |          | PM Peak           |                         |          |
|---------------------------------------------------------------|-------------------|---------------------------|----------|-------------------|-------------------------|----------|
|                                                               | Network Delay (h) | Queue Length (ft)         | Int. LOS | Network Delay (h) | Queue Length (ft)       | Int. LOS |
| <b>Base Year (2009) - Century Ave. &amp; Centennial Rd</b>    |                   |                           |          |                   |                         |          |
| <b>Existing Conditions</b>                                    | 1,104**           | 1,002 (SBT),<br>671 (WBL) | F        | 511**             | 683 (NBT),<br>164 (SBT) | C        |
| <b>Optimized Control</b>                                      | 1,031**           | 952 (SBT),<br>706 (WBL)   | F        | 517**             | 560 (NBT),<br>180 (EBT) | C        |
| <b>Trenton Dr. Signal</b>                                     | 295               | 952 (SBT),<br>706 (WBL)   | F        | 73                | 145 (NBT),<br>180 (EBT) | B        |
| <b>Base Year (2009) - Trenton Dr. &amp; Centennial Rd</b>     |                   |                           |          |                   |                         |          |
| <b>Existing Conditions</b>                                    | 1,104**           | *                         | *        | 511**             | 282 (EB)                | *        |
| <b>Optimized Control</b>                                      | 1,031**           | *                         | *        | 517**             | *                       | *        |
| <b>Trenton Dr. Signal</b>                                     | 295               | 878 (SBT)                 | F        | 73                | 678 (SBT)               | D        |
| <b>Base Year (2009) - I-94 North Ramp &amp; Bismarck Expy</b> |                   |                           |          |                   |                         |          |
| <b>Existing Conditions</b>                                    | 1,104**           | 596 (SBT),<br>255 (NBL)   | F        | 511**             | 211 (NBL),<br>217 (SBT) | B        |
| <b>Optimized Control</b>                                      | 1,031**           | 303 (NBL),<br>371 (SBT)   | D        | 517**             | 240 (SBT),<br>105 (WBL) | A        |
| <b>Trenton Dr. Signal</b>                                     | 295               | 401 (NBL),<br>205 (SBT)   | D        | 73                | 156 (SBT)               | A        |
| <b>Base Year (2009) - I-94 South Ramp &amp; Bismarck Expy</b> |                   |                           |          |                   |                         |          |
| <b>Existing Conditions</b>                                    | 1,104**           | 287 (EBR)                 | C        | 511**             | 213 (NBT),<br>166 (EBL) | B        |
| <b>Optimized Control</b>                                      | 1,031**           | 248 (EBR),<br>131 (SBT)   | B        | 517**             | 163 (NBT),<br>167 (EBL) | B        |
| <b>Trenton Dr. Signal</b>                                     | 295               | 248 (EBR),<br>206 (NBT)   | B        | 73                | 169 (NBT),<br>167 (EBL) | B        |
| <b>Base Year (2009) - Divide Ave. &amp; Bismarck Expy</b>     |                   |                           |          |                   |                         |          |
| <b>Existing Conditions</b>                                    | 1,104**           | 278 (SBT)                 | B        | 511**             | 263 (NBT),<br>239 (EBL) | B        |
| <b>Optimized Control</b>                                      | 1,031**           | 145 (SBT),<br>140 (NBT)   | B        | 517**             | 287 (NBT),<br>223 (EBL) | B        |
| <b>Trenton Dr. Signal</b>                                     | 295               | 135 (SBT),<br>129 (NBT)   | B        | 73                | 287(NBT),<br>223 (EBL)  | B        |

\* - Error in calculation (value is not obtainable), queue length represents Synchro's 95% queue.

\*\* - Overestimated delay due to Synchro's calculation of side-street delay on Trenton Dr.

Note: The signal timing was optimized for each scenario except for the Existing Conditions.

## 7.2 15-Year Forecast (2024)

At the intersection of Century Ave. and Centennial Rd, the 2024 scenarios provided outputs of a LOS of "F" for all of the AM peaks (Table 4). The PM peak LOS was slightly better, having a LOS of "C" for the Existing Control scenario. The PM LOS remained at a "C" for the scenarios implementing a signal at Trenton Dr. and the addition of a NE loop ramp.

When the 2024 network was analyzed using the existing control at the intersection of Trenton Dr. and Centennial Rd, the resulting output indicated an error due to the excessive side-street delay and queue lengths (Table 4). This trend continued for every scenario utilizing the existing

(two-way stop) control. When signalized control was implemented at this intersection, the analysis reported a LOS of “B” for both the AM and PM peak-hour periods. The critical movement during the AM peak was the eastbound right-turn, while the critical movements for the PM peak were the northbound and westbound through movements.

Using the existing intersection control at the intersection of Bismarck Expy and the I-94 North Ramp, a LOS of “D” (AM peak) and “A” (PM peak) were realized (Table 4). The addition of a traffic signal at Trenton Dr. and Centennial Rd had a slight impact on the operations of the north ramp. The LOS changed to an “E” for the AM and a “B” for the PM peak hours. The addition of a NE loop ramp at this intersection significantly improved the LOS during both the AM and PM peaks, which was reported as an “A” for both.

The analysis results for the I-94 South Ramp remained largely unchanged for each of the three scenarios in the 2024 network (Table 4). The intersection LOS output was a “B” during all of the PM peak hours. The AM peak hour results also reported a LOS of “B” for the existing control, and for the Trenton Dr. signalized scenario. The LOS decreased from a “B” to a “C” when the NE loop on-ramp is implemented, which can be expected due to the large platoon of southbound vehicles travelling through the I-94 North Ramp intersection from Trenton Dr.

The intersection of Divide Ave. and Bismarck Expy did not show a significant change in LOS for any of the scenarios. The AM peak LOS remained at “B” and the PM peak LOS was “C” for each scenario (Table 4). The complete intersection inputs and outputs for the 2024 scenarios are provided in Appendices J – O.

Table 4. 2024 Synchro Output

| Scenario                                                          | AM Peak           |                        |          | PM Peak           |                      |          |
|-------------------------------------------------------------------|-------------------|------------------------|----------|-------------------|----------------------|----------|
|                                                                   | Network Delay (h) | Queue Length (ft)      | Int. LOS | Network Delay (h) | Queue Length (ft)    | Int. LOS |
| <b>15-Year Forecast (2024) - Century Ave. &amp; Centennial Rd</b> |                   |                        |          |                   |                      |          |
| Existing Control                                                  | 768**             | 1083 WBL, 908 SBT      | F        | 835**             | 435 NBT, 433 EBT     | C        |
| Trenton Dr. Signal                                                | 277               | 1084 WBL, 921 SBT      | F        | 78                | 433 EBT, 408 NBT     | C        |
| Trenton Dr. Signal & NE Loop Ramp                                 | 239               | 1084 WBL, 921 SBT      | F        | 69                | 433 EBT, 408 NBT     | C        |
| <b>15-Year Forecast (2024) - Trenton Dr. &amp; Centennial Rd</b>  |                   |                        |          |                   |                      |          |
| Existing Control                                                  | 768**             | *                      | *        | 835**             | *                    | *        |
| Trenton Dr. Signal.                                               | 277               | 207 EBR, 162 NBT       | B        | 78                | 814 NBT, 213 WBT     | B        |
| Trenton Dr. Signal & NE Loop Ramp                                 | 239               | 207 EBR                | B        | 69                | 796 NBT, 213 WBT     | B        |
| <b>15-Year Forecast (2024) - North Ramp &amp; Bismarck Expy</b>   |                   |                        |          |                   |                      |          |
| Existing Control                                                  | 768**             | 297 (SBT), 539 (NBL)   | D        | 835**             | 336 SBT              | A        |
| Trenton Dr. Signal                                                | 277               | 1,033 (SBT), 539 (NBL) | E        | 78                | 366 SBT, 307 NBT     | B        |
| Trenton Dr. Signal & NE Loop Ramp                                 | 239               | 106 (WBL)              | A        | 69                | 113 WBL              | A        |
| <b>15-Year Forecast (2024) - South Ramp &amp; Bismarck Expy</b>   |                   |                        |          |                   |                      |          |
| Existing Control                                                  | 768**             | 499 EBR, 176 SBT       | B        | 835**             | 269 EBL, 260 EBR/NBT | B        |
| Trenton Dr. Signal                                                | 277               | 499 EBR, 175 SBT       | B        | 78                | 269 EBL, 260 EBR/NBT | B        |
| Trenton Dr. Signal & NE Loop Ramp                                 | 239               | 499 EBR, 387 SBT       | C        | 69                | 269 EBL, 266 NBT     | B        |
| <b>15-Year Forecast (2024) - Divide Ave. &amp; Bismarck Expy</b>  |                   |                        |          |                   |                      |          |
| Existing Control                                                  | 768**             | 198 SBT                | B        | 835**             | 346 NBT, 284 EBL     | C        |
| Trenton Dr. Signal                                                | 277               | 198 SBT                | B        | 78                | 346 NBT, 284 EBL     | C        |
| Trenton Dr. Signal & NE Loop Ramp                                 | 239               | 197 SBT                | B        | 69                | 346 NBT, 284 EBL     | C        |

\* - Error in calculation (value is not obtainable), queue length represents Synchro's 95% queue.

\*\* - Overestimated delay due to Synchro's calculation of side-street delay on Trenton Dr.

Note: The signal timing was optimized for each scenario.

### 7.3 26-Year Forecast (2035)

The intersection of Century Ave. and Centennial Rd experienced a significant amount of vehicles travelling south and west during the AM peak. As a result, the LOS remains a "F" for all four of the analysis scenarios (Table 5). However, the PM peak LOS was reported as a "C" for the existing conditions, which improves to a "B" for the three alternative scenarios.

The analysis of the Trenton Dr./Centennial Rd intersection again provided invalid results for the existing two-way stop control in the 2035 network (Table 5). However, the addition of a traffic signal provided a LOS of “C” during the AM peak and a LOS of “D” during the PM peak. The AM peak LOS improves to a “B” with the addition of the NE and NE/SW loop ramps. It should be noted that the reported 95<sup>th</sup> percentile queue lengths are approximately 1,029 ft, which may have an effect on I-94 North Ramp (the approximate distance between the North Ramp and the Trenton Dr./Centennial Rd intersection is 780 ft).

The I-94 North Ramp experienced a LOS of “E” for the existing control scenario during the AM peak and a LOS of “B” during the PM peak (Table 5). It should be noted that due to the volume of traffic on Centennial Rd, the NB queue may potentially encroach into the intersection of the North Ramp. Although the LOS remains the same when a signal is added at Trenton Dr., the NB queue lengths at Trenton Dr. may potentially encroach into the intersection of the North Ramp. In addition, the scenarios having the NE loop ramp and the NE/SW loop ramp provide an improved LOS of “A” for both the AM and PM peak hours. However, the NB queues from Trenton Dr. will still potentially exceed the distance between the two intersections.

The I-94 South Ramp (Existing Control) produced a LOS “B” during the AM peak, which remained unchanged when a traffic signal was implemented at Trenton Dr. (Table 5). The LOS for both ramp scenarios during the AM peak was a “B.” During the PM peak, all of the scenarios provided a LOS of “B” for the south ramp intersection.

The intersection of Divide Ave. and Bismarck Expy experienced a LOS of “B” for all of the AM peak scenarios (Table 5). In addition, all of the PM peak scenarios reported a LOS of “C.” The complete intersection inputs and outputs for the 2035 scenarios are provided in Appendices P – W.

Table 5. 2035 Synchro Output

| Scenario                                                          | AM Peak           |                   |          | PM Peak           |                   |          |
|-------------------------------------------------------------------|-------------------|-------------------|----------|-------------------|-------------------|----------|
|                                                                   | Network Delay (h) | Queue Length (ft) | Int. LOS | Network Delay (h) | Queue Length (ft) | Int. LOS |
| <b>26-Year Forecast (2035) - Century Ave. &amp; Centennial Rd</b> |                   |                   |          |                   |                   |          |
| Existing Control                                                  | 1972**            | 973 SBT, 691 WBL  | F        | 1161**            | 330 NBT, 173 SBT  | C        |
| Trenton Dr. Signal                                                | 279               | 973 SBT, 691 WBL  | F        | 100               | 155 SBT           | B        |
| Signal at Trenton Dr. & NE Loop Ramp                              | 228               | 948 SBT, 696 WBL  | F        | 94                | 155 SBT           | B        |
| Trenton Dr. Signal & NE/SW Loop Ramps                             | 212               | 973 SBT, 691 WBL  | F        | 93                | 155 SBT           | B        |
| <b>26-Year Forecast (2035) - Trenton Dr. &amp; Centennial Rd</b>  |                   |                   |          |                   |                   |          |
| Existing Control                                                  | 1972**            | *                 | *        | 1161**            | *                 | *        |
| Trenton Signal                                                    | 279               | 351 EBR, 320 SBT  | C        | 100               | 1028 NBT, 300 WBL | D        |
| Trenton Signal & NE Loop Ramp                                     | 228               | 351 EBR, 192 SBT  | B        | 94                | 1029 NBT, 300 WBL | D        |
| Trenton Dr. Signal & NE/SW Loop Ramps                             | 212               | 351 EBR, 220 SBT  | B        | 93                | 1029 NBT, 300 WBL | D        |
| <b>26-Year Forecast (2035) - North Ramp &amp; Bismarck Expy</b>   |                   |                   |          |                   |                   |          |
| Existing Control                                                  | 1972**            | 646 SBT, 610 NBL  | E        | 1161**            | 264 NBL, 350 SBT  | B        |
| Trenton Signal                                                    | 279               | 951 SBT, 610 NBL  | E        | 100               | 277 SBT, 239 NBL  | B        |
| Trenton Dr. Signal & NE Loop Ramp                                 | 228               | 193 WBL           | A        | 94                | 204 NBT           | A        |
| Trenton Dr. Signal & NE/SW Loop Ramps                             | 212               | 193 WBL           | A        | 93                | 204 NBT           | A        |
| <b>26-Year Forecast (2035) - South Ramp &amp; Bismarck Expy</b>   |                   |                   |          |                   |                   |          |
| Existing Control                                                  | 1972**            | 298 EBR, 173 NBT  | B        | 1161**            | 216 NBT, 178 EBL  | B        |
| Trenton Signal                                                    | 279               | 298 EBR, 173 NBT  | B        | 100               | 201 NBT, 178 EBL  | B        |
| Trenton Dr. Signal & NE Loop Ramp                                 | 228               | 319 SBT, 298 EBR  | B        | 94                | 178 EBL, 162 NBT  | B        |
| Trenton Dr. Signal & NE/SW Loop Ramps                             | 212               | 318 SBT, 298 EBR  | B        | 93                | 178 EBL, 162 NBT  | B        |
| <b>26-Year Forecast (2035) - Divide Ave. &amp; Bismarck Expy</b>  |                   |                   |          |                   |                   |          |
| Existing Control                                                  | 1972**            | 356 SBT, 168 SBL  | B        | 1161**            | 353 NBT, 336 EBL  | C        |
| Trenton Signal                                                    | 279               | 356 SBT, 168 SBL  | B        | 100               | 358 NBT, 336 EBL  | C        |
| Trenton Dr. Signal & NE Loop Ramp                                 | 228               | 386 SBT, 180 SBL  | B        | 94                | 358 NBT, 336 EBL  | C        |
| Trenton Dr. Signal & NE/SW Loop Ramps                             | 212               | 386 SBT, 180 SBL  | B        | 93                | 358 NBT, 336 EBL  | C        |

\* - Error in calculation (value is not obtainable), queue length represents Synchro's 95% queue.

\*\* - Overestimated delay due to Synchro's calculation of side-street delay on Trenton Dr.

Note: The signal timing was optimized for each scenario.

## 7.4 50-Year Forecast (2059)

The 50-year forecast network geometry remained the same as the 2035 network to show the impact of traffic growth due to the modified and additional development over an additional 15-year period. Using the existing intersection control, the network delay was 2,179 hours (AM peak) and 1,416 hours (PM peak), as shown in Table 6.

The scenario implementing the signal at Trenton Dr. and the NE loop ramp provided a network delay for the AM Peak (336 hours) and PM Peak (210 hours). Adding a signal at Trenton Dr. and both the NE and SW loop ramps had no significant effect on network delay for the AM peak hour (336 hours) and PM peak hour (209 hours).

At the intersection of Century Ave. and Centennial Rd, all scenarios returned a LOS of “F” for the AM peak and a “C” during the PM peak (Table 6). The critical movements at this intersection were the southbound through and westbound left-turn which occurred during the AM peak. The results from the analysis at Trenton Dr. and Centennial Rd also remained relatively constant, having a LOS of “E” during the PM peak. The AM peak LOS improved from a “C” for the Trenton Dr. signal scenario to a “B” for the two remaining scenarios. Note that due to the traffic volumes on Centennial Rd. and the relatively limited capacity of the roadway facility, the northbound 95% queue lengths exceed the distance to the North Ramp of I-94 by approximately 400 ft. This potential spillback may affect the operations at the intersection of the North Ramp.

The I-94 North Ramp experienced a LOS of “F” during the AM peak and a “B” during the PM peak (Table 6). The signal at Trenton Dr. may have an effect on the north ramp during the PM peak due to capacity issues on Centennial Rd/Bismarck Expy. The two scenarios utilizing loop ramps at the I-94 interchange showed a significant improvement in LOS, which changed to an “A” for both the AM and PM peak hours.

The I-94 South Ramp experienced a LOS of a “C” during both the AM and PM peak periods when the existing control was used (Table 6). The addition of a signal at Trenton Dr. did not change the operations at the south ramp. The LOS for the AM and PM peak periods remained a “C” for the remaining scenarios.

Although several geometric changes were incorporated into analysis, no modifications were made to the Divide Ave. approaches at the intersection of Bismarck Expy and Divide Ave. (Table 6). As a result the intersection delay calculated for the 2059 horizon was excessive. The LOS during the AM peak remained a “D” for all scenarios, and an “E” for all PM peak hour scenarios. The complete intersection inputs and outputs for the 2059 scenarios are provided in Appendices X – EE.

Table 6. 2059 Network Output

| Scenario                                                          | AM Peak           |                   |          | PM Peak           |                   |          |
|-------------------------------------------------------------------|-------------------|-------------------|----------|-------------------|-------------------|----------|
|                                                                   | Network Delay (h) | Queue Length (ft) | Int. LOS | Network Delay (h) | Queue Length (ft) | Int. LOS |
| <b>50-Year Forecast (2059) - Century Ave. &amp; Centennial Rd</b> |                   |                   |          |                   |                   |          |
| Existing Control                                                  | 2,179**           | 1138 SBT, 643 WBL | F        | 1,416**           | 436 NBT, 216 EBT  | C        |
| Trenton Dr. Signal                                                | 477               | 1138 SBT, 643 WBL | F        | 232               | 218 EBT, 188 SBT  | C        |
| Trenton Dr. Signal & NE Loop Ramp                                 | 336               | 1138 SBT, 608 WBL | F        | 210               | 218 EBT, 188 SBT  | C        |
| Trenton Dr. Signal & NE/SW Loop Ramps                             | 336               | 1138 SBT, 608 WBL | F        | 209               | 218 EBT, 188 SBT  | C        |
| <b>50-Year Forecast (2059) - Trenton Dr. &amp; Centennial Rd</b>  |                   |                   |          |                   |                   |          |
| Existing Control                                                  | 2,179**           | *                 | *        | 1,416**           | *                 | *        |
| Trenton Dr. Signal                                                | 477               | 457 EBR, 235 SBT  | C        | 232               | 1196 NBT, 353 WBL | E        |
| Trenton Dr. Signal & NE Loop Ramp                                 | 336               | 396 EBR, 215 SBT  | B        | 210               | 1170 NBT, 353 WBL | E        |
| Trenton Dr. Signal & NE/SW Loop Ramps                             | 336               | 396 EBR, 215 SBT  | B        | 209               | 1170 NBT, 353 WBL | E        |
| <b>50-Year Forecast (2059) - North Ramp &amp; Bismarck Expy</b>   |                   |                   |          |                   |                   |          |
| Existing Control                                                  | 2,179**           | 582 NBL, 642 SBT  | F        | 1,416**           | 333 SBT, 321 NBL  | B        |
| Trenton Dr. Signal                                                | 477               | 1091 SBT, 582 NBL | F        | 232               | 283 SBT, 318 NBL  | B        |
| Trenton Dr. Signal & NE Loop Ramp                                 | 336               | 244 WBL, 161 SBT  | A        | 210               | 276 NBT, 205 WBL  | A        |
| Trenton Dr. Signal & NE/SW Loop Ramps                             | 336               | 244 WBL, 161 SBT  | A        | 209               | 276 NBT, 205 WBL  | A        |
| <b>50-Year Forecast (2059) - South Ramp &amp; Bismarck Expy</b>   |                   |                   |          |                   |                   |          |
| Existing Control                                                  | 2,179**           | 396 EBR, 226 SBT  | C        | 1,416**           | 235 NBT, 195 EBL  | C        |
| Trenton Dr. Signal                                                | 477               | 396 EBR, 226 SBT  | C        | 232               | 235 NBT, 195 EBL  | C        |
| Trenton Dr. Signal & NE Loop Ramp                                 | 336               | 503 SBT, 396 EBR  | C        | 210               | 275 NBT, 195 EBL  | C        |
| Trenton Dr. Signal & NE/SW Loop Ramps                             | 336               | 503 SBT, 395 EBR  | C        | 209               | 275 NBT, 195 EBL  | C        |
| <b>50-Year Forecast (2059) - Divide Ave. &amp; Bismarck Expy</b>  |                   |                   |          |                   |                   |          |
| Existing Control                                                  | 2,179**           | 885 SBT, 435 WBR  | D        | 1,416**           | 861 WBR, 614 NBT  | E        |
| Trenton Dr. Signal                                                | 477               | 885 SBT, 435 WBR  | D        | 232               | 861 WBR, 614 NBT  | E        |
| Trenton Dr. Signal & NE Loop Ramp                                 | 336               | 885 SBT, 435 WBR  | D        | 210               | 861 WBR, 614 NBT  | E        |
| Trenton Dr. Signal & NE/SW Loop Ramps                             | 336               | 885 SBT, 435 WBR  | D        | 209               | 861 WBR, 614 NBT  | E        |

\* - Error in calculation (value is not obtainable), queue length represents Synchro's 95% queue.

\*\* - Overestimated delay due to Synchro's calculation of side-street delay on Trenton Dr.

Note: The signal timing was optimized for each scenario.

Due to the degradation of the LOS at several intersections during the 2059 output, the corridor was also analyzed as a 6-lane arterial. The 6-lane facility was created several hundred feet prior to Century Ave. and Divide Ave to provide adequate transitions between the 4 and 6-lane facilities. Based on the projected 2059 ADT and LOS thresholds, extending the 6-lanes to Main Ave. would provide additional benefits. Table 7 illustrates the comparison between a 4-lane and 6-lane corridor for the Trenton Dr. signal & NE Loop Ramp scenario, which provided the most long-term benefits. Improvements can be seen in the AM and PM network delays, as well as a majority of the intersection LOS. Detailed comparisons for the I-94 North and South Ramps are discussed in the previous sections. Typical ADT thresholds for a 4-lane facility with left- and right-turn lanes operating at a LOS “D” range from 30,000 to 35,000 vehicles. The projected 2059 ADT for Centennial Rd/Bismarck Expy ranges from 25,800 (just south of Century Ave.) to 42,500 (between Divide Ave. and the I-94 South Ramp), as shown in Appendix A. The complete intersection inputs and outputs for the 6-lane scenarios are provided in Appendices FF – GG.

Table 7. 2059 Synchro Output Comparison (4-Lane &amp; 6-Lane)

| Scenario                                                          | AM Peak           |                   |          | PM Peak           |                   |          |
|-------------------------------------------------------------------|-------------------|-------------------|----------|-------------------|-------------------|----------|
|                                                                   | Network Delay (h) | Queue Length (ft) | Int. LOS | Network Delay (h) | Queue Length (ft) | Int. LOS |
| <b>50-Year Forecast (2059) - Century Ave. &amp; Centennial Rd</b> |                   |                   |          |                   |                   |          |
| Trenton Dr. Signal & NE Loop Ramp (4-Lane)                        | 336               | 1138 SBT, 608 WBL | F        | 210               | 218 EBT, 188 SBT  | C        |
| Trenton Dr. Signal & NE Loop Ramp (6-Lane)                        | 212               | 786 SBT, 576 WBL  | F        | 116               | 193 EBT, 162 SBT  | B        |
| <b>50-Year Forecast (2059) - Trenton Dr. &amp; Centennial Rd</b>  |                   |                   |          |                   |                   |          |
| Trenton Dr. Signal & NE Loop Ramp (4-Lane)                        | 336               | 396 EBR, 215 SBT  | B        | 210               | 1170 NBT, 353 WBL | E        |
| Trenton Dr. Signal & NE Loop Ramp (6-Lane)                        | 212               | 293 EBR, 180 SBT  | B        | 116               | 687 NBT, 262 WBL  | B        |
| <b>50-Year Forecast (2059) - North Ramp &amp; Bismarck Expy</b>   |                   |                   |          |                   |                   |          |
| Trenton Dr. Signal & NE Loop Ramp (4-Lane)                        | 336               | 244 WBL, 161 SBT  | A        | 210               | 276 NBT, 205 WBL  | A        |
| Trenton Dr. Signal & NE Loop Ramp (6-Lane)                        | 212               | 193 WBL, 115 SBT  | A        | 116               | 134 NBT, 205 WBL  | A        |
| <b>50-Year Forecast (2059) - South Ramp &amp; Bismarck Expy</b>   |                   |                   |          |                   |                   |          |
| Trenton Dr. Signal & NE Loop Ramp (4-Lane)                        | 336               | 503 SBT, 396 EBR  | C        | 210               | 275 NBT, 195 EBL  | C        |
| Trenton Dr. Signal & NE Loop Ramp (6-Lane)                        | 212               | 259 SBT, 322 EBR  | B        | 116               | 121 NBT, 189 EBL  | B        |
| <b>50-Year Forecast (2059) - Divide Ave. &amp; Bismarck Expy</b>  |                   |                   |          |                   |                   |          |
| Trenton Dr. Signal & NE Loop Ramp (4-Lane)                        | 336               | 885 SBT, 435 WBR  | D        | 210               | 861 WBR, 614 NBT  | E        |
| Trenton Dr. Signal & NE Loop Ramp (6-Lane)                        | 212               | 247 SBT, 389 WBR  | C        | 116               | 808 WBR, 426 NBT  | D        |

## 7.5 I-94 Interchange Ramp Operations

This section illustrates the detailed output for the intersections at the north and south ramps of the I-94 and Centennial Rd/Bismarck Expy Interchange. One of the main objectives of this study was to determine if and when loop ramps will be needed at these intersections to facilitate traffic accessing I-94.

### 7.5.1 I-94 North Ramp

During the AM peak-hour period, the I-94 North Ramp illustrated LOS ranging from “D” to “F” during the 2009 base case (Table 8). The existing optimized and Trenton Dr. signal scenarios provide a LOS of “D.” It should be pointed out that some of the intersection improvements are a

result of increasing the green time for the southbound phase, which increases the delay for the northbound left-turn phase. For the 2035 and 2059 planning horizons, the scenarios incorporating NE and NE/SW loop ramps provide LOS of “A.”

The northbound left-turn movement had AM peak traffic volume for the 2009, 2024, 2035, and 2059 planning horizons of 331, 412, 471, and 447 vehicles, respectively. Due to the large number of traffic traveling southbound, the northbound left-turn movement is only able to turn during the protected portion of the northbound protected/permitted phase. For the 2009 horizon, the LOS for the northbound left-turn movement ranges from a “C” to an “F” and the addition of the Trenton Dr. signal does not significantly affect the north ramp’s operation compared to the Existing Optimized scenario (Table 8). The LOS for the northbound left-turn phase remains an “F” unless a NE loop ramp is incorporated, which eliminates delay for this movement and improves the southbound delay since the left-turn phase is removed. Therefore, the intersection delay is significantly reduced with the NE loop ramp, which would be realized at the present time.

During the PM peak-hour period, the I-94 North Ramp exhibited LOS ranging from “A” to “B” for the 2009 base case (Table 9). A signal installation at Trenton Dr. improved the intersection to a LOS of “A.” The 2024, 2035, and 2059 planning horizons incorporating NE and NE/SW loop ramps provide intersection LOS of “A.”

The northbound left-turn movement had PM peak traffic volume for the 2009, 2024, 2035, and 2059 planning horizons of 371, 462, 528, and 501 vehicles, respectively (Table 9). Because the southbound movement has significantly less traffic during the PM peak compared to the AM peak, the northbound left-turn movement does not experience significant delay time. The signal installation at Trenton Dr. creates additional gaps for the northbound left-turn movement, resulting in lower delay time. As expected, incorporating NE and NE/SW loop ramps eliminates delay time for this movement.

Table 8. I-94 North Ramp (AM Peak)

|                  | Scenario                              | MOE       | WB Approach |      | NB Approach |     |     | SB Approach |       | Int. Summary |
|------------------|---------------------------------------|-----------|-------------|------|-------------|-----|-----|-------------|-------|--------------|
|                  |                                       |           | L           | R    | L           | T   | R   | T           | R     |              |
| 2009 AM          | Existing Conditions                   | Delay (s) | 47.5        | 16.7 | 34.1        | 2.3 | -   | 223.4       | 223.4 | 157.4        |
|                  |                                       | Volume    | 91          | 9    | 331         | 425 | -   | 1,361       | 304   | 2,521        |
|                  |                                       | LOS       | D           | B    | C           | A   | -   | F           | F     | F            |
|                  | Existing Optimized                    | Delay (s) | 48.1        | 16.8 | 156.1       | 2.6 | -   | 44.4        | 44.4  | 49.3         |
|                  |                                       | Volume    | 91          | 9    | 331         | 425 | -   | 1,361       | 304   | 2,521        |
|                  |                                       | LOS       | D           | B    | F           | A   | -   | D           | D     | D            |
|                  | Trenton Dr. Signal                    | Delay (s) | 48.1        | 16.8 | 154.6       | 1.8 | -   | 37.7        | 37.7  | 44.4         |
|                  |                                       | Volume    | 91          | 9    | 331         | 425 | -   | 1,361       | 304   | 2,521        |
|                  |                                       | LOS       | D           | B    | F           | A   | -   | D           | D     | D            |
| 2024 AM          | Existing Control                      | Delay (s) | 53.9        | 21.9 | 157.1       | 1.6 | -   | 40.4        | 40.4  | 49.5         |
|                  |                                       | Volume    | 87          | 9    | 412         | 529 | -   | 1,700       | 380   | 3,117        |
|                  |                                       | LOS       | D           | C    | F           | A   | -   | D           | D     | D            |
|                  | Trenton Dr. Signal                    | Delay (s) | 53.9        | 21.9 | 157.1       | 1.6 | -   | 49.2        | 49.2  | 55.4         |
|                  |                                       | Volume    | 87          | 9    | 412         | 529 | -   | 1,700       | 380   | 3,117        |
|                  |                                       | LOS       | D           | C    | F           | A   | -   | D           | D     | E            |
|                  | Trenton Dr. Signal & NE Loop Ramp     | Delay (s) | 53.9        | 21.9 | -           | 3.5 | .4  | 3.3         | 3.3   | 4.5          |
|                  |                                       | Volume    | 87          | 9    | -           | 529 | 412 | 1,700       | 380   | 3,117        |
|                  |                                       | LOS       | D           | C    | -           | A   | A   | A           | A     | A            |
| 2035 AM          | Existing Control                      | Delay (s) | 64.2        | 16.9 | 177.2       | 2.8 | -   | 87.3        | 4.9   | 73.6         |
|                  |                                       | Volume    | 175         | 17   | 471         | 605 | -   | 1,949       | 435   | 3,652        |
|                  |                                       | LOS       | E           | B    | F           | A   | -   | F           | A     | E            |
|                  | Trenton Dr. Signal                    | Delay (s) | 64.2        | 16.9 | 177.2       | 2.8 | -   | 85.7        | 2.8   | 72.5         |
|                  |                                       | Volume    | 175         | 17   | 471         | 605 | -   | 1,949       | 435   | 3,652        |
|                  |                                       | LOS       | E           | B    | F           | A   | -   | F           | A     | E            |
|                  | Trenton Dr. Signal & NE Loop Ramp     | Delay (s) | 61.4        | 16.5 | -           | 2.5 | 0.6 | 2.6         | 0.4   | 4.9          |
|                  |                                       | Volume    | 175         | 17   | -           | 605 | 471 | 1,949       | 435   | 3,652        |
|                  |                                       | LOS       | E           | B    | -           | A   | A   | A           | A     | A            |
|                  | Trenton Dr. Signal & NE/SW Loop Ramps | Delay (s) | 61.4        | 16.5 | -           | 2.5 | 0.6 | 2.6         | 0.4   | 4.9          |
|                  |                                       | Volume    | 175         | 17   | -           | 605 | 471 | 1,949       | 435   | 3,652        |
|                  |                                       | LOS       | E           | B    | -           | A   | A   | A           | A     | A            |
| 2059 AM          | Existing Control                      | Delay (s) | 69.3        | 16.1 | 195         | 3.8 | -   | 117.6       | 5.1   | 92.8         |
|                  |                                       | Volume    | 193         | 19   | 447         | 573 | -   | 2,128       | 475   | 3,835        |
|                  |                                       | LOS       | E           | B    | F           | A   | -   | F           | A     | F            |
|                  | Trenton Dr. Signal                    | Delay (s) | 69.3        | 16.1 | 195         | 3.8 | -   | 118.8       | 4.6   | 93.3         |
|                  |                                       | Volume    | 193         | 19   | 447         | 573 | -   | 2,128       | 475   | 3,835        |
|                  |                                       | LOS       | E           | B    | F           | A   | -   | F           | A     | F            |
|                  | Trenton Dr. Signal & NE Loop Ramp     | Delay (s) | 69.3        | 16.1 | -           | 5.4 | 0.5 | 5.7         | 0.6   | 7.7          |
|                  |                                       | Volume    | 193         | 19   | -           | 573 | 447 | 2,128       | 475   | 3,835        |
|                  |                                       | LOS       | E           | B    | -           | A   | A   | A           | A     | A            |
|                  | Trenton Dr. Signal & NE/SW Loop Ramps | Delay (s) | 69.3        | 16.1 | -           | 5.4 | 0.5 | 5.7         | 0.6   | 7.7          |
|                  |                                       | Volume    | 193         | 19   | -           | 573 | 447 | 2,128       | 475   | 3,835        |
|                  |                                       | LOS       | E           | B    | -           | A   | A   | A           | A     | A            |
| 2059 AM (6-Lane) | Trenton Dr. Signal & NE Loop Ramp     | Delay (s) | 54.2        | 13.8 | -           | 4.9 | 1.1 | 3.6         | 0.8   | 5.7          |
|                  |                                       | Volume    | 193         | 19   | -           | 573 | 447 | 2,128       | 475   | 3,835        |
|                  |                                       | LOS       | D           | B    | -           | A   | A   | A           | A     | A            |

Table 9. I-94 North Ramp (PM Peak)

|                  | Scenario                              | MOE       | WB Approach |      | NB Approach |       |     | SB Approach |      | Int. Summary |
|------------------|---------------------------------------|-----------|-------------|------|-------------|-------|-----|-------------|------|--------------|
|                  |                                       |           | L           | R    | L           | T     | R   | T           | R    |              |
| 2009 PM          | Existing Conditions                   | Delay (s) | 48.6        | 12.7 | 20.1        | 5.3   | -   | 21.1        | 21.1 | 15.0         |
|                  |                                       | Volume    | 99          | 21   | 371         | 1,055 | -   | 536         | 149  | 2,231        |
|                  |                                       | LOS       | D           | B    | C           | A     | -   | C           | C    | B            |
|                  | Existing Optimized                    | Delay (s) | 49.1        | 12.8 | 10.4        | 2.2   | -   | 13.6        | 13.6 | 9.4          |
|                  |                                       | Volume    | 99          | 21   | 371         | 1,055 | -   | 536         | 149  | 2,231        |
|                  |                                       | LOS       | D           | B    | B           | A     | -   | B           | B    | A            |
|                  | Trenton Dr. Signal                    | Delay (s) | 49.1        | 12.8 | 10.8        | 1.6   | -   | 13.5        | 13.5 | 9.2          |
|                  |                                       | Volume    | 99          | 21   | 371         | 1,055 | -   | 536         | 149  | 2,231        |
|                  |                                       | LOS       | D           | B    | B           | A     | -   | B           | B    | A            |
| 2024 PM          | Existing Control                      | Delay (s) | 54.2        | 17.3 | 13.0        | 1.9   | -   | 15.2        | 15.2 | 9.8          |
|                  |                                       | Volume    | 95          | 20   | 462         | 1,313 | -   | 670         | 186  | 2,746        |
|                  |                                       | LOS       | D           | B    | B           | A     | -   | B           | B    | A            |
|                  | Trenton Dr. Signal                    | Delay (s) | 54.2        | 17.3 | 12.1        | 7.6   | -   | 18.9        | 18.9 | 13.6         |
|                  |                                       | Volume    | 95          | 20   | 462         | 1,313 | -   | 670         | 186  | 2,746        |
|                  |                                       | LOS       | D           | B    | B           | A     | -   | B           | B    | B            |
|                  | Trenton Drive Signal & NE Loop Ramp   | Delay (s) | 54.2        | 17.3 | -           | 2.3   | 0.4 | 1.6         | 1.6  | 3.7          |
|                  |                                       | Volume    | 95          | 20   | -           | 1,313 | 462 | 670         | 186  | 2,746        |
|                  |                                       | LOS       | D           | B    | -           | A     | A   | A           | A    | A            |
| 2035 PM          | Existing Control                      | Delay (s) | 54.1        | 17.3 | 17.8        | 3.1   | -   | 20.6        | 3.4  | 11.6         |
|                  |                                       | Volume    | 92          | 19   | 528         | 1,502 | -   | 767         | 213  | 3,121        |
|                  |                                       | LOS       | D           | B    | B           | A     | -   | C           | A    | B            |
|                  | Trenton Dr. Signal                    | Delay (s) | 54.1        | 17.3 | 16.7        | 3.6   | -   | 20.9        | 7.1  | 11.9         |
|                  |                                       | Volume    | 92          | 19   | 528         | 1,502 | -   | 767         | 213  | 3,121        |
|                  |                                       | LOS       | D           | B    | B           | A     | -   | C           | A    | B            |
|                  | Trenton Dr. Signal & NE Loop Ramp     | Delay (s) | 54.1        | 17.3 | -           | 4.2   | 0.5 | 3.5         | 1.5  | 4.8          |
|                  |                                       | Volume    | 92          | 19   | -           | 1,502 | 528 | 767         | 213  | 3,121        |
|                  |                                       | LOS       | D           | B    | -           | A     | A   | A           | A    | A            |
|                  | Trenton Dr. Signal & NE/SW Loop Ramps | Delay (s) | 54.1        | 17.3 | -           | 4.2   | 0.5 | 3.5         | 1.5  | 4.8          |
|                  |                                       | Volume    | 92          | 19   | -           | 1,502 | 528 | 767         | 213  | 3,121        |
|                  |                                       | LOS       | D           | B    | -           | A     | A   | A           | A    | A            |
| 2059 PM          | Existing Control                      | Delay (s) | 64.5        | 12.3 | 27.4        | 6.3   | -   | 26.5        | 4.0  | 18.4         |
|                  |                                       | Volume    | 210         | 45   | 501         | 1,424 | -   | 838         | 233  | 3,251        |
|                  |                                       | LOS       | E           | B    | C           | A     | -   | C           | A    | B            |
|                  | Trenton Dr. Signal                    | Delay (s) | 64.5        | 12.4 | 27.6        | 7.1   | -   | 24.7        | 6.9  | 18.6         |
|                  |                                       | Volume    | 210         | 45   | 501         | 1,424 | -   | 838         | 233  | 3,251        |
|                  |                                       | LOS       | E           | B    | C           | A     | -   | C           | A    | B            |
|                  | Trenton Dr. Signal & NE Loop Ramp     | Delay (s) | 53.9        | 12.0 | -           | 6.3   | 0.3 | 6.4         | 2.2  | 8.3          |
|                  |                                       | Volume    | 210         | 45   | -           | 1,424 | 501 | 838         | 233  | 3,251        |
|                  |                                       | LOS       | D           | B    | -           | A     | A   | A           | A    | A            |
|                  | Trenton Dr. Signal & NE/SW Loop Ramps | Delay (s) | 53.9        | 12.0 | -           | 6.3   | 0.3 | 6.4         | 2.2  | 8.3          |
|                  |                                       | Volume    | 210         | 45   | -           | 1,424 | 501 | 838         | 233  | 3,251        |
|                  |                                       | LOS       | D           | B    | -           | A     | A   | A           | A    | A            |
| 2059 PM (6-Lane) | Trenton Dr. Signal & NE Loop Ramp     | Delay (s) | 53.1        | 18.1 | -           | 4.6   | 0.5 | 5.7         | 2.5  | 7.4          |
|                  |                                       | Volume    | 210         | 45   | -           | 1,424 | 501 | 838         | 233  | 3,251        |
|                  |                                       | LOS       | D           | B    | -           | A     | A   | A           | A    | A            |

### 7.5.2 I-94 South Ramp

During the AM peak-hour period, the I-94 South Ramp illustrated LOS ranging from “B” to “C” during the 2009 base case (Table 10). The signal installation at Trenton Dr. provides a LOS of “B” for the 2009 planning horizon, which is the same as the existing conditions. The

southbound left-turn movement has a low number of vehicles (23 to 39 vehicles), resulting in lower delay time for all planning horizons and scenarios.

The critical movement for the I-94 South Ramp during the AM peak period is the eastbound right-turn movement (Table 10). To bring the LOS to at least a "D" for all planning horizons, two right-turn lanes were incorporated into the 2035 and 2059 planning horizons to serve the forecasted traffic (720 vehicles in 2035 and 764 vehicles in 2059).

During the PM peak-hour period, the I-94 South Ramp illustrated LOS ranging from "B" to "C" among all analysis scenarios (Table 10). For the 2009 base case, the signal installation at Trenton Dr. provides a LOS of "B," which is the same as the existing conditions. The southbound left-turn movement has a low number of vehicles (27 to 46 vehicles); however, the opposing northbound through traffic ranges from 1,134 to 1,862. Therefore, delay time increases for each planning horizon. Note that the delay for the southbound left-turn phase could be decreased with the addition of a left-turn phase (when the turning traffic exceeds 100 vehicles per hour).

Similar to the AM peak, the critical movement for PM peak at the I-94 South Ramp was the eastbound movement (Table 11). The eastbound left-turn movement incurred the highest delay during the PM Peak. Incorporating two left-turns achieved a LOS of "D" for all planning horizons to serve the forecasted traffic (529 vehicles for 2035 and 561 vehicles for 2059).

Table 10. I-94 South Ramp (AM Peak)

|                  | Scenario                              | MOE       | EB Approach |      | NB Approach |     | SB Approach |       |    | Int. Summary |
|------------------|---------------------------------------|-----------|-------------|------|-------------|-----|-------------|-------|----|--------------|
|                  |                                       |           | L           | R    | T           | R   | L           | T     | R  |              |
| 2009 AM          | Existing Conditions                   | Delay (s) | 22.6        | 62.0 | 10.3        | 2.5 | 8.4         | 10.9  | -  | 21.6         |
|                  |                                       | Volume    | 96          | 389  | 564         | 82  | 23          | 906   | -  | 2,060        |
|                  |                                       | LOS       | C           | E    | B           | A   | A           | B     | -  | C            |
|                  | Existing Optimized                    | Delay (s) | 17.0        | 39.0 | 12.4        | 2.5 | 3.9         | 5.9   | -  | 14.7         |
|                  |                                       | Volume    | 96          | 389  | 564         | 82  | 23          | 906   | -  | 2,060        |
|                  |                                       | LOS       | B           | D    | B           | A   | A           | A     | -  | B            |
|                  | Trenton Dr. Signal                    | Delay (s) | 17.0        | 39.0 | 13.4        | 2.4 | 5.4         | 7.9   | -  | 15.9         |
|                  |                                       | Volume    | 96          | 389  | 564         | 82  | 23          | 906   | -  | 2,060        |
|                  |                                       | LOS       | B           | D    | B           | A   | A           | A     | -  | B            |
| 2024 AM          | Existing Control                      | Delay (s) | 16.7        | 40.8 | 19.3        | 3.6 | 4.4         | 8.2   | -  | 18.7         |
|                  |                                       | Volume    | 143         | 580  | 693         | 101 | 27          | 1,063 | -  | 2,607        |
|                  |                                       | LOS       | B           | D    | B           | A   | A           | A     | -  | B            |
|                  | Trenton Dr. Signal                    | Delay (s) | 16.7        | 40.8 | 19.3        | 3.6 | 4.4         | 7.4   | -  | 18.3         |
|                  |                                       | Volume    | 143         | 580  | 693         | 101 | 27          | 1,063 | -  | 2,607        |
|                  |                                       | LOS       | B           | D    | B           | A   | A           | A     | -  | B            |
|                  | Trenton Dr. Signal & NE Loop Ramp     | Delay (s) | 16.7        | 40.8 | 19.3        | 3.6 | 12.6        | 19.2  | -  | 23.2         |
|                  |                                       | Volume    | 143         | 580  | 693         | 101 | 27          | 1,063 | -  | 2,607        |
|                  |                                       | LOS       | B           | D    | B           | A   | B           | B     | -  | C            |
| 2035 AM          | Existing Control                      | Delay (s) | 24.2        | 37.6 | 12.2        | 3.4 | 2.6         | 5.3   | -  | 15.9         |
|                  |                                       | Volume    | 178         | 720  | 788         | 115 | 30          | 1,178 | -  | 3,009        |
|                  |                                       | LOS       | C           | D    | B           | A   | A           | A     | -  | B            |
|                  | Trenton Dr. Signal                    | Delay (s) | 24.2        | 37.6 | 12.2        | 3.4 | 2.6         | 5.2   | -  | 15.8         |
|                  |                                       | Volume    | 178         | 720  | 788         | 115 | 30          | 1,178 | -  | 3,009        |
|                  |                                       | LOS       | C           | D    | B           | A   | A           | A     | -  | B            |
|                  | Trenton Dr. Signal & NE Loop Ramp     | Delay (s) | 24.2        | 37.8 | 12.4        | 3.9 | 7.2         | 10.6  | -  | 18.1         |
|                  |                                       | Volume    | 178         | 720  | 788         | 115 | 30          | 1,178 | -  | 3,009        |
|                  |                                       | LOS       | C           | D    | B           | A   | A           | B     | -  | B            |
| 2059 AM          | Existing Control                      | Delay (s) | 24.2        | 37.8 | 12.4        | 3.9 | -           | 10.9  | 0  | 18.2         |
|                  |                                       | Volume    | 178         | 720  | 788         | 115 | -           | 1,178 | 30 | 3,009        |
|                  |                                       | LOS       | C           | D    | B           | A   | -           | B     | A  | B            |
|                  | Trenton Dr. Signal & NE/SW Loop Ramps | Delay (s) | 25.1        | 52.1 | 13.5        | 3.1 | 3.2         | 29    | -  | 28.4         |
|                  |                                       | Volume    | 188         | 764  | 926         | 135 | 39          | 1,528 | -  | 3,580        |
|                  |                                       | LOS       | C           | D    | B           | A   | A           | C     | -  | C            |
|                  | Trenton Dr. Signal                    | Delay (s) | 25.1        | 52.1 | 13.5        | 3.1 | 3.2         | 29    | -  | 28.4         |
|                  |                                       | Volume    | 188         | 764  | 926         | 135 | 39          | 1,528 | -  | 3,580        |
|                  |                                       | LOS       | C           | D    | B           | A   | A           | C     | -  | C            |
| 2059 AM (6-Lane) | Trenton Dr. Signal & NE Loop Ramp     | Delay (s) | 25.1        | 52.1 | 13.5        | 3.1 | 6.6         | 35.0  | -  | 31.0         |
|                  |                                       | Volume    | 188         | 764  | 926         | 135 | 39          | 1,528 | -  | 3,580        |
|                  |                                       | LOS       | C           | D    | B           | A   | A           | C     | -  | C            |
|                  | Trenton Dr. Signal & NE/SW Loop Ramps | Delay (s) | 25.1        | 52.1 | 13.5        | 3.1 | -           | 35.1  | 0  | 31.0         |
|                  |                                       | Volume    | 188         | 764  | 926         | 135 | -           | 1,528 | 39 | 3,580        |
|                  |                                       | LOS       | C           | D    | B           | A   | -           | D     | A  | C            |
|                  | Trenton Dr. Signal                    | Delay (s) | 21.7        | 37.1 | 13.2        | 3.6 | 9.1         | 12.7  | -  | 18.1         |
|                  |                                       | Volume    | 188         | 764  | 926         | 135 | 39          | 1,528 | -  | 3,580        |
|                  |                                       | LOS       | C           | D    | B           | A   | A           | B     | -  | B            |

Table 11. I-94 South Ramp (PM Peak)

|                  | Scenario                              | MOE       | EB Approach |      | NB Approach |     | SB Approach |      |     | Int. Summary |
|------------------|---------------------------------------|-----------|-------------|------|-------------|-----|-------------|------|-----|--------------|
|                  |                                       |           | L           | R    | T           | R   | L           | T    | R   |              |
| 2009 PM          | Existing Conditions                   | Delay (s) | 42.3        | 13.9 | 8.6         | 1.6 | 7.6         | 3.0  | -   | 11.3         |
|                  |                                       | Volume    | 213         | 286  | 1,134       | 111 | 27          | 557  | -   | 2,328        |
|                  |                                       | LOS       | D           | B    | A           | A   | A           | A    | -   | B            |
|                  | Existing Optimized                    | Delay (s) | 42.6        | 12.5 | 7.9         | 1.9 | 6.1         | 3.9  | -   | 11.0         |
|                  |                                       | Volume    | 213         | 286  | 1,134       | 111 | 27          | 557  | -   | 2,328        |
|                  |                                       | LOS       | D           | B    | A           | A   | A           | A    | -   | B            |
|                  | Trenton Dr. Signal                    | Delay (s) | 42.6        | 12.5 | 7.6         | 0.5 | 7.5         | 4.6  | -   | 10.9         |
|                  |                                       | Volume    | 213         | 286  | 1,134       | 111 | 27          | 557  | -   | 2,328        |
|                  |                                       | LOS       | D           | B    | A           | A   | A           | A    | -   | B            |
| 2024 PM          | Existing Control                      | Delay (s) | 44.5        | 32.3 | 13.2        | 3.0 | 9.0         | 2.8  | -   | 16.5         |
|                  |                                       | Volume    | 318         | 426  | 1,394       | 136 | 32          | 654  | -   | 2,960        |
|                  |                                       | LOS       | D           | C    | B           | A   | A           | A    | -   | B            |
|                  | Trenton Dr. Signal                    | Delay (s) | 44.5        | 32.3 | 13.2        | 3.0 | 23.1        | 13.6 | -   | 19.0         |
|                  |                                       | Volume    | 318         | 426  | 1,394       | 136 | 32          | 654  | -   | 2,960        |
|                  |                                       | LOS       | D           | C    | B           | A   | C           | B    | -   | B            |
|                  | Trenton Dr. Signal & NE Loop Ramp     | Delay (s) | 44.5        | 32.3 | 13.0        | 2.9 | 14.6        | 7.1  | -   | 17.4         |
|                  |                                       | Volume    | 318         | 426  | 1,394       | 136 | 32          | 654  | -   | 2,960        |
|                  |                                       | LOS       | D           | C    | B           | A   | B           | A    | -   | B            |
| 2035 PM          | Existing Control                      | Delay (s) | 44.1        | 13.5 | 8.8         | 1.4 | 16.6        | 4.3  | -   | 12.4         |
|                  |                                       | Volume    | 394         | 529  | 1,584       | 155 | 35          | 724  | -   | 3,421        |
|                  |                                       | LOS       | D           | B    | A           | A   | B           | A    | -   | B            |
|                  | Trenton Dr. Signal                    | Delay (s) | 44.1        | 13.5 | 8.3         | 1.2 | 16.5        | 4.1  | -   | 12.1         |
|                  |                                       | Volume    | 394         | 529  | 1,584       | 155 | 35          | 724  | -   | 3,421        |
|                  |                                       | LOS       | D           | B    | A           | A   | B           | A    | -   | B            |
|                  | Trenton Dr. Signal & NE Loop Ramp     | Delay (s) | 44.1        | 13.5 | 8.0         | 0.8 | 13.7        | 3.5  | -   | 11.8         |
|                  |                                       | Volume    | 394         | 529  | 1,584       | 155 | 35          | 724  | -   | 3,421        |
|                  |                                       | LOS       | D           | B    | A           | A   | B           | A    | -   | B            |
| 2059 PM          | Existing Control                      | Delay (s) | 47.4        | 32.2 | 21.6        | 0.1 | 57.9        | 0.6  | -   | 20.3         |
|                  |                                       | Volume    | 418         | 561  | 1,862       | 182 | 46          | 939  | -   | 4,008        |
|                  |                                       | LOS       | D           | C    | C           | A   | E           | A    | -   | C            |
|                  | Trenton Dr. Signal                    | Delay (s) | 47.4        | 32.3 | 21.6        | 0.1 | 57.4        | 0.7  | -   | 20.3         |
|                  |                                       | Volume    | 418         | 561  | 1,862       | 182 | 46          | 939  | -   | 4,008        |
|                  |                                       | LOS       | D           | C    | C           | A   | E           | A    | -   | C            |
|                  | Trenton Dr. Signal & NE Loop Ramp     | Delay (s) | 47.4        | 32.4 | 20.8        | 0.8 | 67.1        | 7.6  | -   | 21.7         |
|                  |                                       | Volume    | 418         | 561  | 1,862       | 182 | 46          | 939  | -   | 4,008        |
|                  |                                       | LOS       | D           | C    | C           | A   | E           | A    | -   | C            |
| 2059 PM (6-Lane) | Trenton Dr. Signal & NE/SW Loop Ramps | Delay (s) | 47.4        | 32.4 | 20.8        | 0.8 | -           | 7.6  | 0.0 | 21.0         |
|                  |                                       | Volume    | 418         | 561  | 1,862       | 182 | -           | 939  | 46  | 4,008        |
|                  |                                       | LOS       | D           | C    | C           | A   | -           | A    | A   | C            |
| 2059 PM (6-Lane) | Trenton Dr. Signal & NE Loop Ramp     | Delay (s) | 44.3        | 31.0 | 6.0         | 0.4 | 38.9        | 4.2  | -   | 13.2         |
|                  |                                       | Volume    | 418         | 561  | 1,862       | 182 | 46          | 939  | -   | 4,008        |
|                  |                                       | LOS       | D           | C    | A           | A   | D           | A    | -   | B            |

## 8.0 SUMMARY/RECOMMENDATIONS

The purpose of this study was to evaluate the operational performance of Centennial Rd/Bismarck Expy and I-94 Interchange and surrounding intersections between Divide Ave. and Century Ave. This study evaluated a total of 30 different scenarios using various intersection controls and geometric alternatives.

Currently, the corridor experiences significant traffic volume and congestion during the AM and PM peak-hour periods. The congestion along this corridor will continue to increase as development continues on the east side of Bismarck, ND. Although an additional interchange at 66<sup>th</sup> St. E. will assist the eastern portion of the city, traffic forecasts estimate that this interchange will not significantly relieve traffic volume along the Centennial Rd/Bismarck Expy corridor.

To assist the traffic operations in the near- and long- term planning horizons, several traffic control and geometric improvements could be incorporated. Although a signal warrant was not conducted at Trenton Dr. (as a part of this study), it was observed that the installation of a traffic signal at this intersection would benefit the traffic operations for the existing and future conditions, although there is a potential for spillback into the I-94 North Ramp in the 2035 and 2059 4-lane network scenarios. Signalizing this intersection was also recommended by a previous traffic study that was conducted by Kadrmas, Lee, and Jackson, Inc. [1].

A comparison was conducted for the 2059 network which modeled Centennial Rd/Bismarck Expy as both a 4-lane and a 6-lane corridor. The results of the comparison showed several benefits to expanding the corridor to six lanes, such as reducing overall network delay and improving several intersection LOS. In addition, the ADT along Centennial Rd/Bismarck Expy ranges from 25,800 to 42,500 vehicles. The threshold ADT for a 4-lane arterial with turning lanes to maintain a LOS "D" can range from 30,000 to 35,000 vehicles. Another benefit of increasing the corridor to 6-lanes is the potential for eliminating any spillback of vehicles into adjacent intersections.

Although geometric changes (the addition of turn lanes) were made to Century Ave. for the 2035 and 2059 scenarios, the LOS remained at an "F." The LOS at this intersection was also reported as an "F" for the 6-lane 2059 network. Since Century Ave. is the only route for drivers to the northwest of the study area, the geometric changes do little to alleviate the delays at the intersection of Centennial Rd and Century Ave. The delays experienced at this intersection may force drivers to alter their routes or departure times.

The long-term improvements relate to geometric modifications of the corridor. Based on the planning and operational analyses conducting in this study, several geometric improvements could be incorporated to accommodate the current and future traffic volume. The main improvements relate to incorporating a NE loop ramp, and expanding Centennial Rd/Bismarck Expy to a six-lane roadway by 2059. Due to the low southbound left-turn traffic (current and projected) at the I-94 South Ramp, a SW loop ramp is not recommended at this time. However, a southbound left-turn phase may be incorporated if traffic volume increases. The modifications that will enhance the study area along with the planning horizon that receives significant benefits include the following:

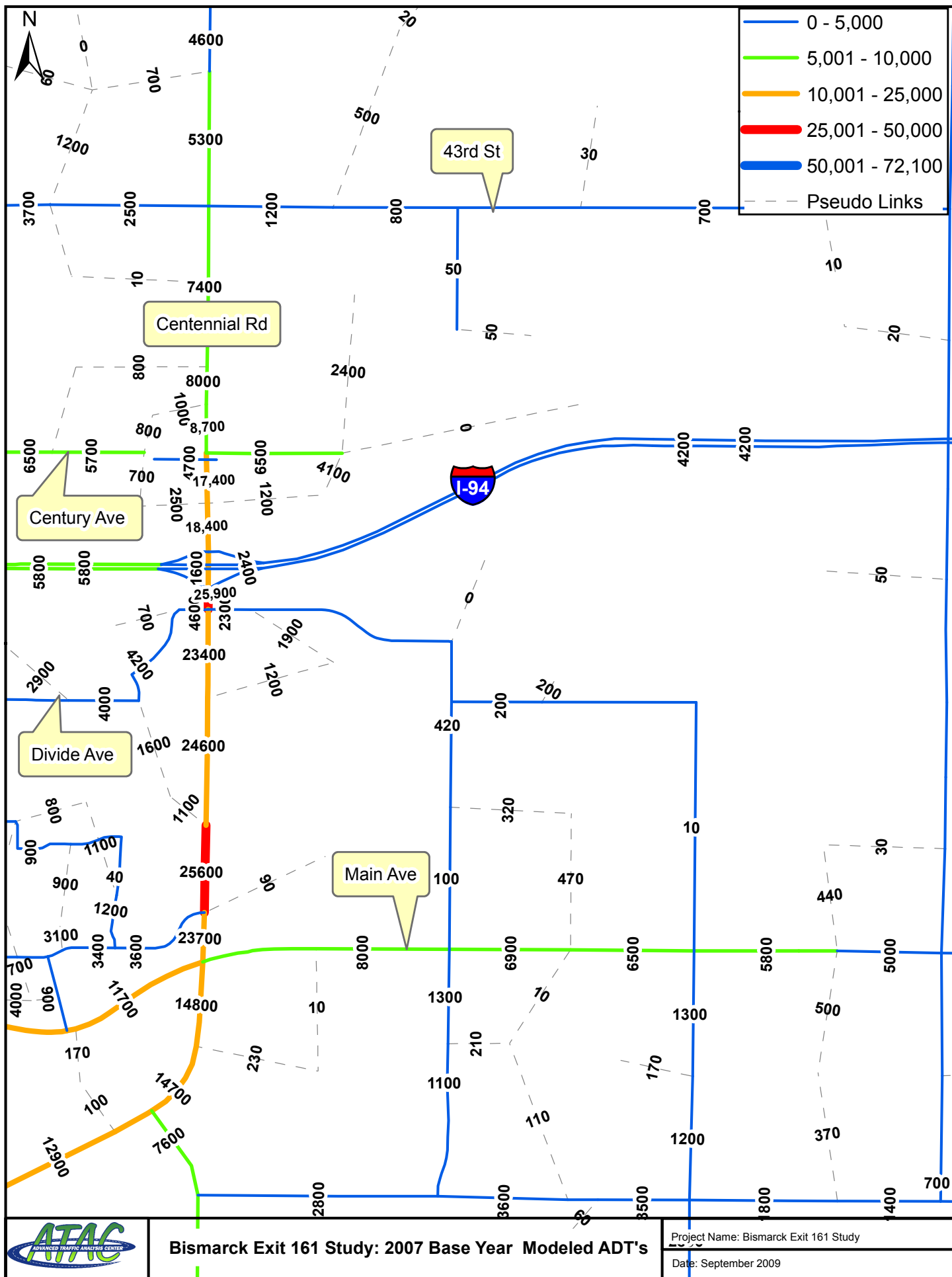
- Widen Century Ave. to a four-lane cross section with turn lanes (2009)
- Add a dual westbound left-turn at Century Ave. (2009)
- Install a traffic signal at the intersection of Trenton Dr. & Centennial Rd with turn lanes (2009)
- Add a NE loop ramp at the I-94 North Ramp (2009)

- Widen the eastbound off-ramp of the I-94 South Ramp to accommodate dual left-turn and dual right-turn lanes (2035)
- Widen the Centennial Rd/Bismarck Expy to a six-lane cross section with left and right turn lanes (2059)

## REFERENCES

1. Kadrmas, Lee & Jackson, Inc. "Traffic Operations Study – East Century Avenue/Centennial Road." SU-1-981(085)095, PCN 17369. Bismarck, ND, May 2009.

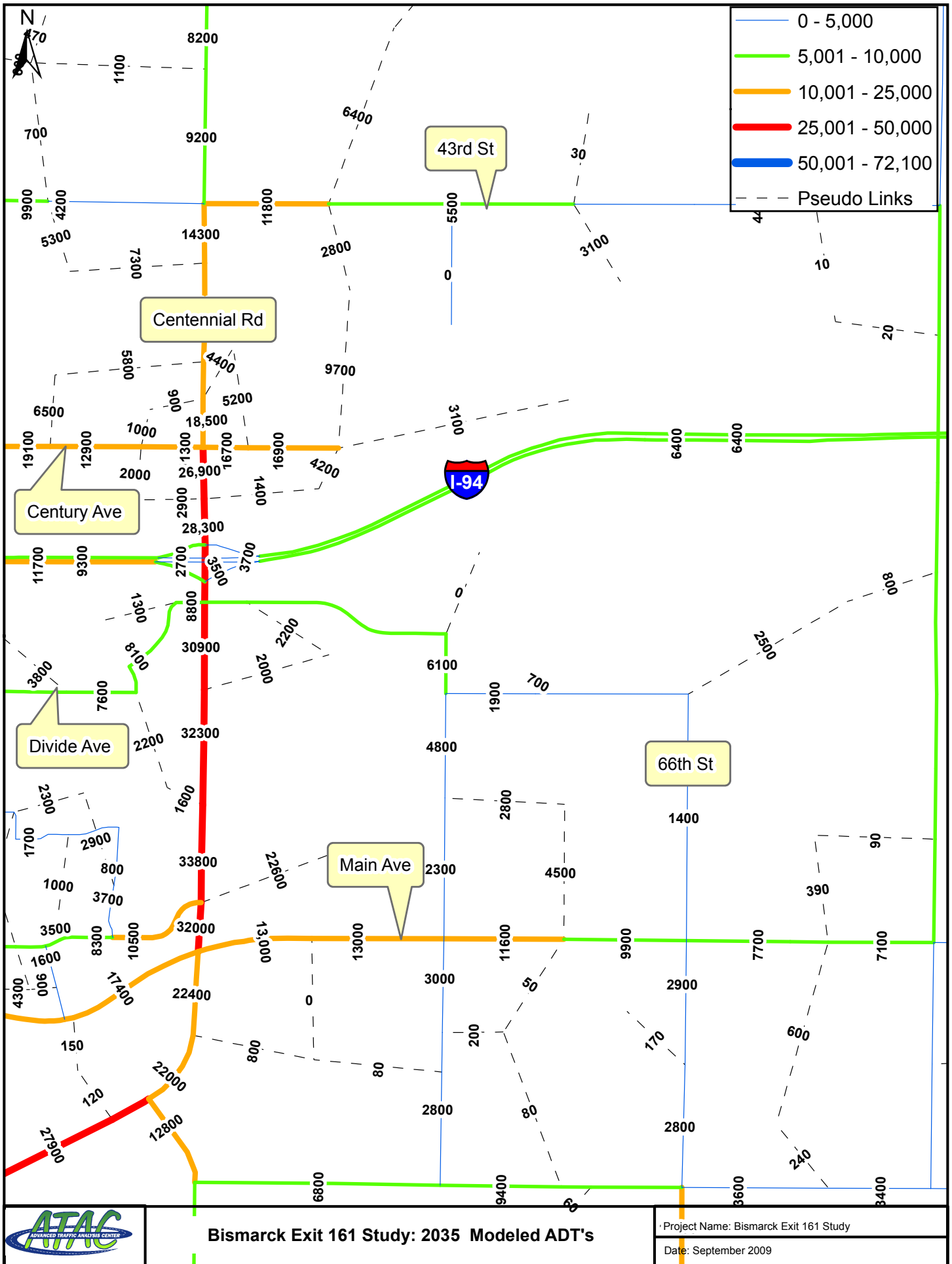
**Appendix A: ADT Data**

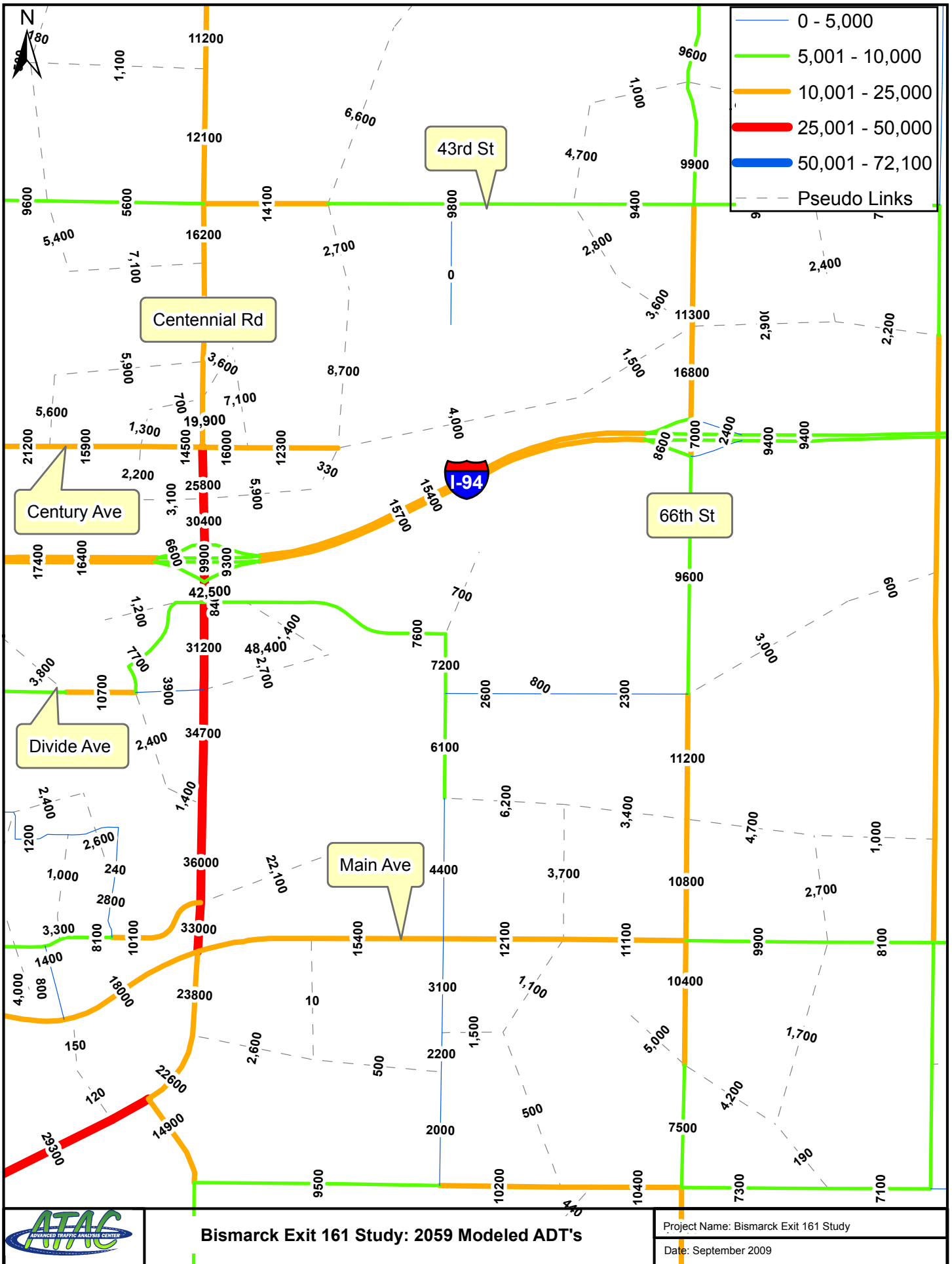


**Bismarck Exit 161 Study: 2007 Base Year Modeled ADT's**

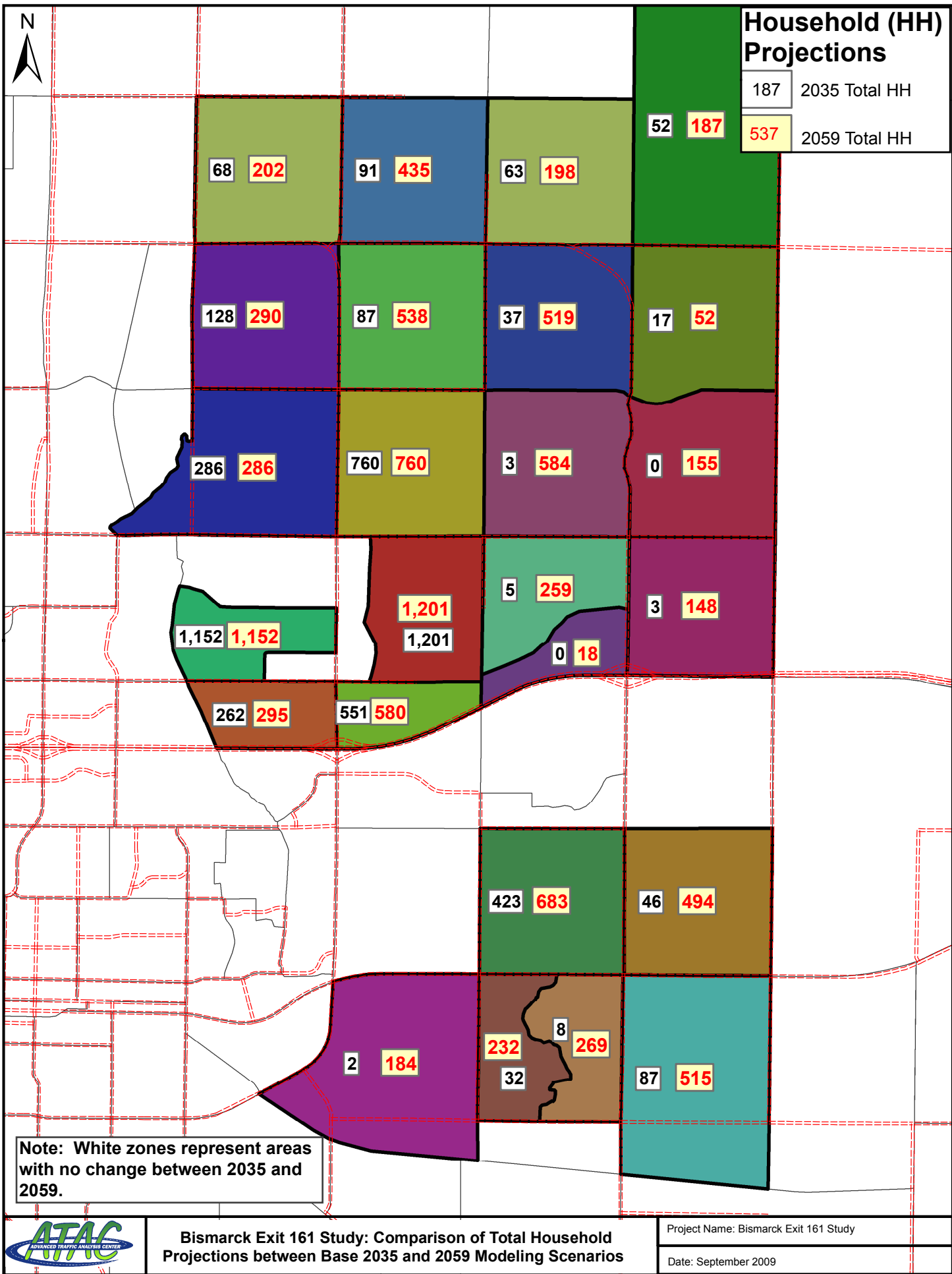
Project Name: Bismarck Exit 161 Study

Date: September 2009



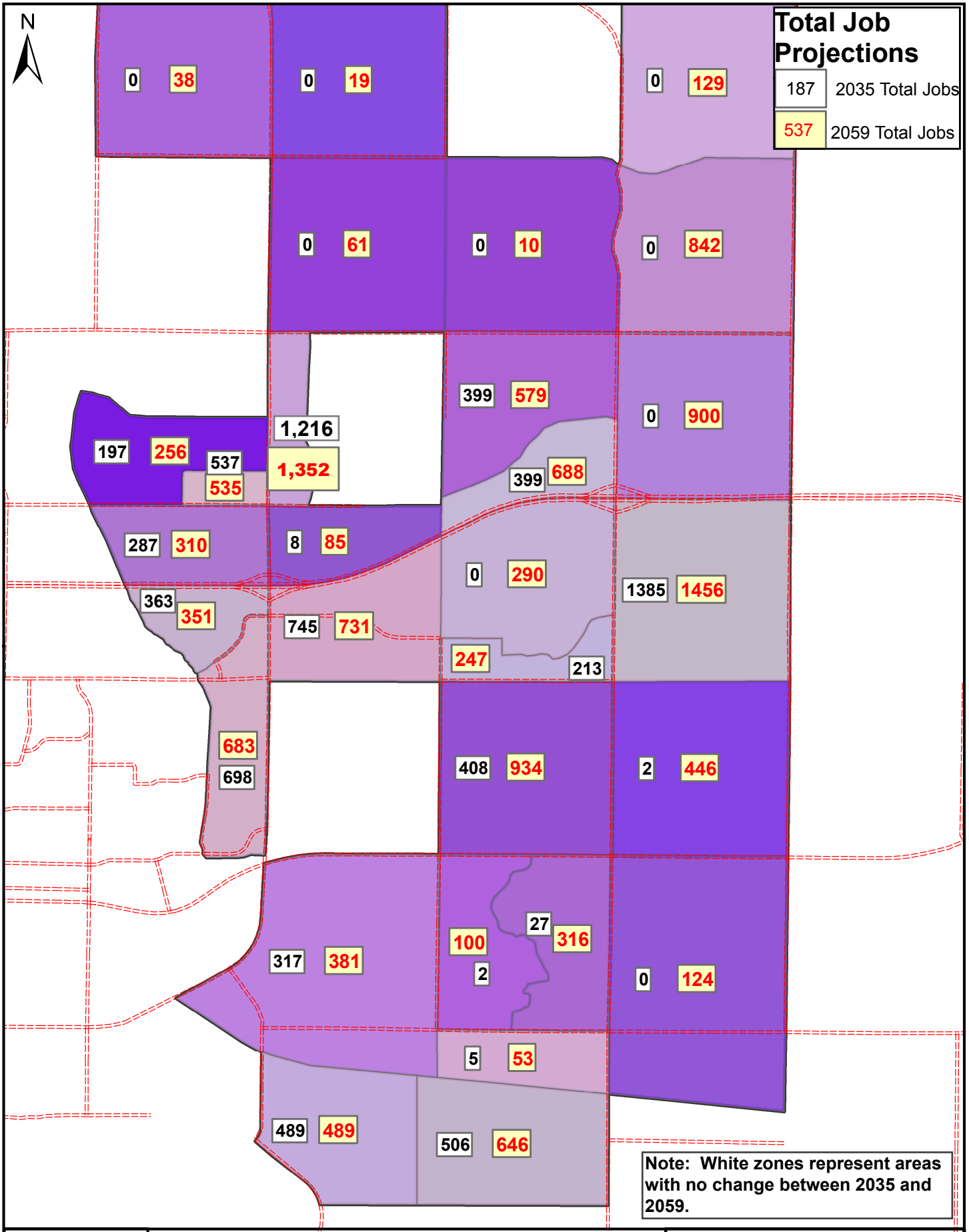


## **Appendix B: Household/Job Data**



**Bismarck Exit 161 Study: Comparison of Total Household Projections between Base 2035 and 2059 Modeling Scenarios**

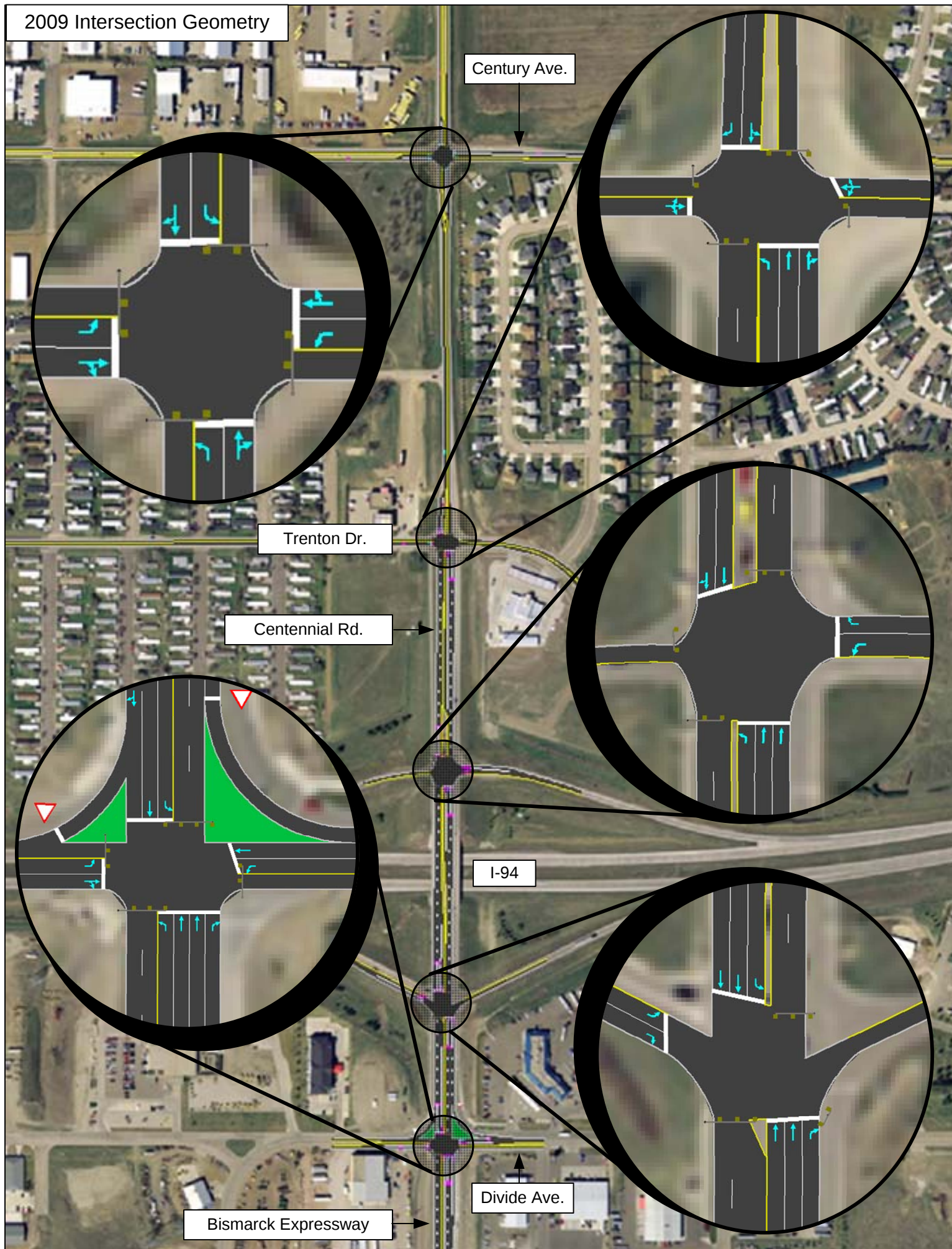
Project Name: Bismarck Exit 161 Study  
Date: September 2009



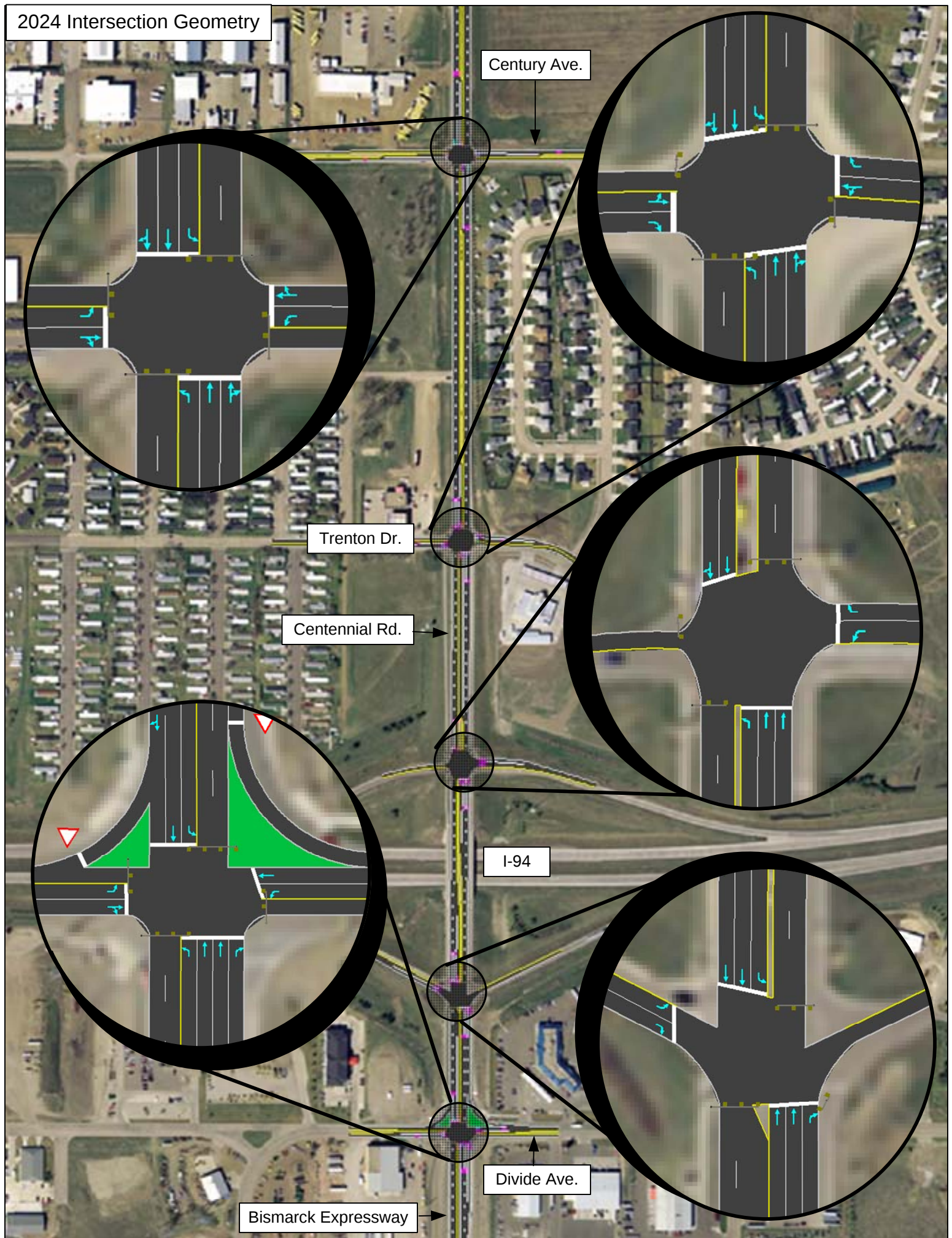


## **Appendix C: Synchro Network Intersection Geometry**

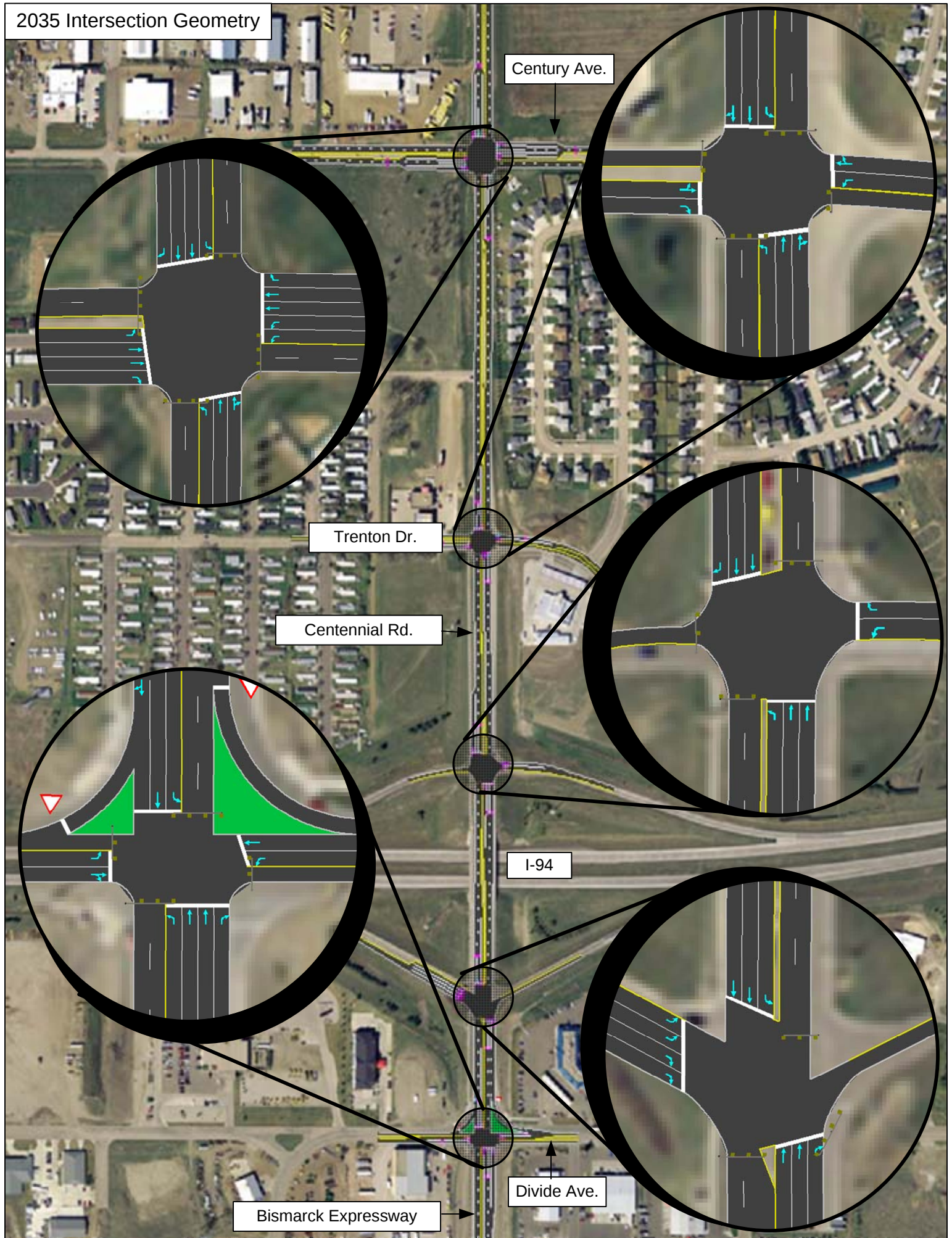
2009 Intersection Geometry



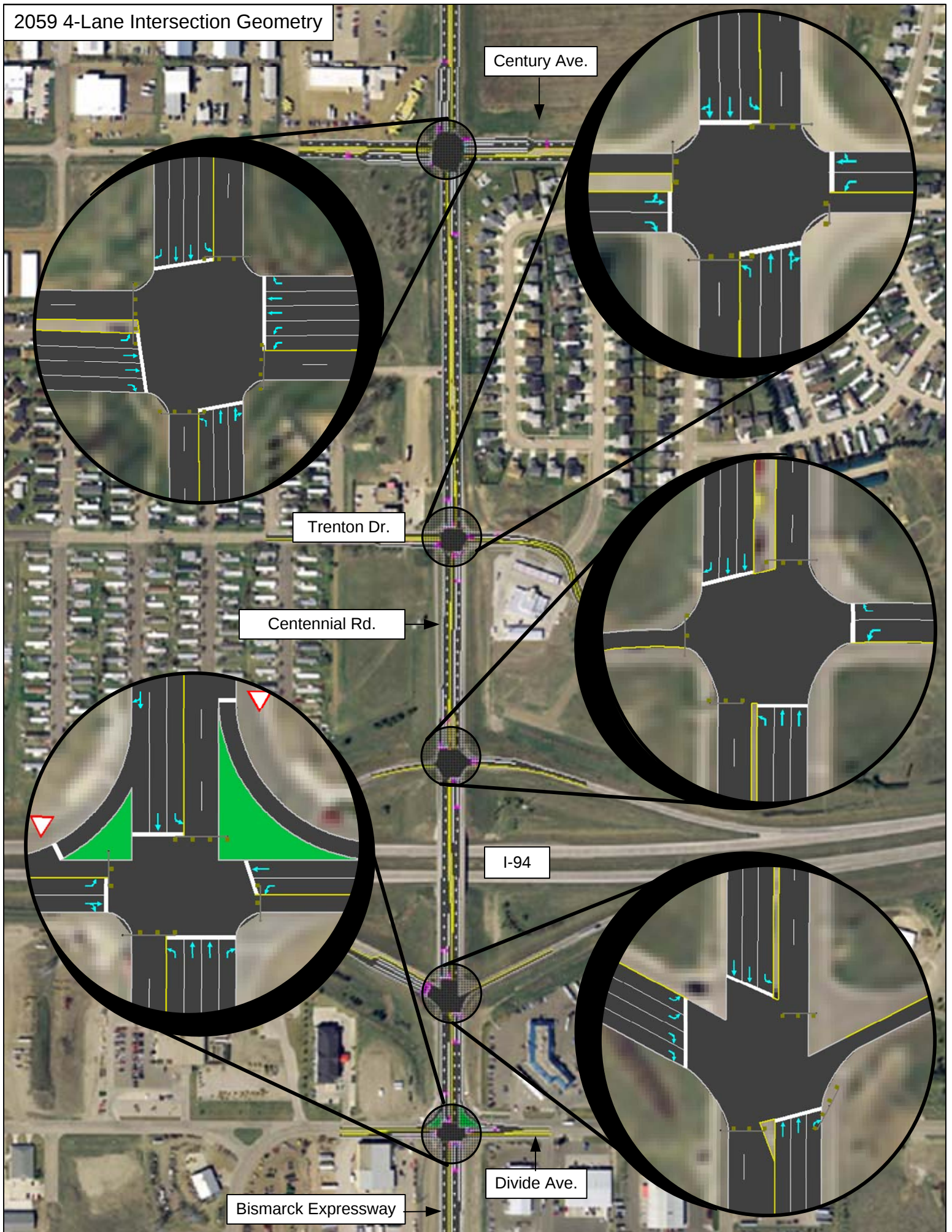
2024 Intersection Geometry



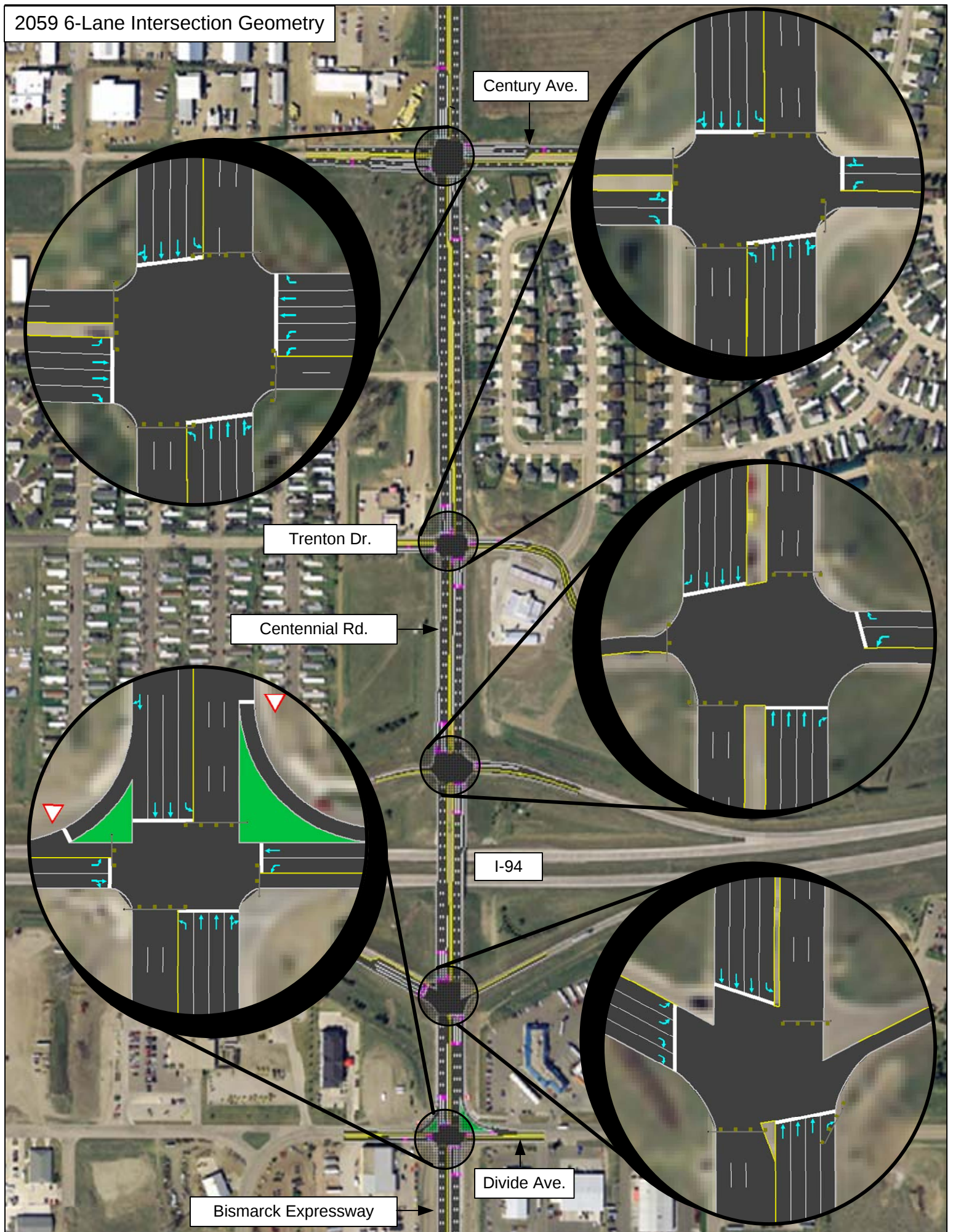
2035 Intersection Geometry



2059 4-Lane Intersection Geometry



2059 6-Lane Intersection Geometry



## **Appendix D: 2009 - Existing Conditions AM (1A1)**

## Bismarck Exit 161 Operational Study

## 1: Divide Ave &amp; N Bismarck Expy

|                         |  |  |  |  |  |  |   |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |                                                                                   |  |  |  |  |  |  |  |  |  |
| Volume (vph)            | 91                                                                                | 98                                                                                | 14                                                                                | 69                                                                                | 47                                                                                | 161                                                                               | 25                                                                                  | 430                                                                                 | 72                                                                                  | 290                                                                                 | 995                                                                                 | 222                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 150                                                                               |                                                                                   | 0                                                                                 | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                 |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                   |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 100                                                                               |                                                                                   | 25                                                                                | 100                                                                               |                                                                                   | 100                                                                               | 100                                                                                 |                                                                                     | 150                                                                                 | 100                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 25                                                                                |                                                                                   |                                                                                   | 25                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 371                                                                               |                                                                                   |                                                                                   | 341                                                                               |                                                                                   |                                                                                     | 614                                                                                 |                                                                                     |                                                                                     | 458                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 10.1                                                                              |                                                                                   |                                                                                   | 9.3                                                                               |                                                                                   |                                                                                     | 10.5                                                                                |                                                                                     |                                                                                     | 7.8                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.78                                                                              | 0.61                                                                              | 0.58                                                                              | 0.86                                                                              | 0.69                                                                              | 0.81                                                                              | 0.63                                                                                | 0.90                                                                                | 0.75                                                                                | 0.68                                                                                | 0.71                                                                                | 0.69                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 13%                                                                               | 5%                                                                                | 0%                                                                                | 6%                                                                                | 17%                                                                               | 26%                                                                               | 4%                                                                                  | 9%                                                                                  | 18%                                                                                 | 2%                                                                                  | 1%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 117                                                                               | 185                                                                               | 0                                                                                 | 80                                                                                | 68                                                                                | 199                                                                               | 40                                                                                  | 478                                                                                 | 96                                                                                  | 426                                                                                 | 1723                                                                                | 0                                                                                   |
| Turn Type               | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                              |                                                                                   | pm+ov                                                                             | Perm                                                                                |                                                                                     | Perm                                                                                | pm+pt                                                                               |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 | 5                                                                                 |                                                                                     | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                   |                                                                                     | 6                                                                                   | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 | 4                                                                                 |                                                                                   | 8                                                                                 | 8                                                                                 | 5                                                                                 | 6                                                                                   | 6                                                                                   | 6                                                                                   | 5                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               | 6.0                                                                               |                                                                                   | 6.0                                                                               | 6.0                                                                               | 5.0                                                                               | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 5.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 30.0                                                                              | 30.0                                                                              |                                                                                   | 30.0                                                                              | 30.0                                                                              | 9.8                                                                               | 22.9                                                                                | 22.9                                                                                | 22.9                                                                                | 9.8                                                                                 | 28.7                                                                                |                                                                                     |
| Total Split (s)         | 30.0                                                                              | 30.0                                                                              | 0.0                                                                               | 30.0                                                                              | 30.0                                                                              | 14.0                                                                              | 46.0                                                                                | 46.0                                                                                | 46.0                                                                                | 14.0                                                                                | 60.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 33.3%                                                                             | 33.3%                                                                             | 0.0%                                                                              | 33.3%                                                                             | 33.3%                                                                             | 15.6%                                                                             | 51.1%                                                                               | 51.1%                                                                               | 51.1%                                                                               | 15.6%                                                                               | 66.7%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 3.0                                                                               | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 | 3.0                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 1.0                                                                               | 1.8                                                                                 | 1.8                                                                                 | 1.8                                                                                 | 1.0                                                                                 | 1.8                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 5.7                                                                                 | 5.7                                                                                 | 5.7                                                                                 | 4.0                                                                                 | 5.7                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lead                                                                              | Lag                                                                                 | Lag                                                                                 | Lag                                                                                 | Lead                                                                                |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                               | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 |                                                                                     |                                                                                     |
| Recall Mode             | None                                                                              | None                                                                              |                                                                                   | None                                                                              | None                                                                              | None                                                                              | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               | None                                                                                | C-Min                                                                               |                                                                                     |
| Act Effect Green (s)    | 14.6                                                                              | 14.6                                                                              |                                                                                   | 14.6                                                                              | 14.6                                                                              | 33.1                                                                              | 47.2                                                                                | 47.2                                                                                | 47.2                                                                                | 65.4                                                                                | 63.7                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.16                                                                              | 0.16                                                                              |                                                                                   | 0.16                                                                              | 0.16                                                                              | 0.37                                                                              | 0.52                                                                                | 0.52                                                                                | 0.52                                                                                | 0.73                                                                                | 0.71                                                                                |                                                                                     |
| v/c Ratio               | 0.60                                                                              | 0.62                                                                              |                                                                                   | 0.52                                                                              | 0.26                                                                              | 0.33                                                                              | 0.33                                                                                | 0.28                                                                                | 0.13                                                                                | 0.59                                                                                | 0.70                                                                                |                                                                                     |
| Control Delay           | 47.0                                                                              | 42.1                                                                              |                                                                                   | 45.6                                                                              | 33.5                                                                              | 4.0                                                                               | 25.8                                                                                | 13.7                                                                                | 3.7                                                                                 | 9.7                                                                                 | 11.2                                                                                |                                                                                     |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.1                                                                                 | 0.1                                                                                 |                                                                                     |
| Total Delay             | 47.0                                                                              | 42.1                                                                              |                                                                                   | 45.6                                                                              | 33.5                                                                              | 4.0                                                                               | 25.8                                                                                | 13.7                                                                                | 3.7                                                                                 | 9.8                                                                                 | 11.3                                                                                |                                                                                     |
| LOS                     | D                                                                                 | D                                                                                 |                                                                                   | D                                                                                 | C                                                                                 | A                                                                                 | C                                                                                   | B                                                                                   | A                                                                                   | A                                                                                   | B                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 44.0                                                                              |                                                                                   |                                                                                   | 19.4                                                                              |                                                                                   |                                                                                     | 12.9                                                                                |                                                                                     |                                                                                     | 11.0                                                                                |                                                                                     |
| Approach LOS            |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | B                                                                                 |                                                                                   |                                                                                     | B                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 63                                                                                | 95                                                                                |                                                                                   | 42                                                                                | 34                                                                                | 0                                                                                 | 12                                                                                  | 75                                                                                  | 0                                                                                   | 74                                                                                  | 245                                                                                 |                                                                                     |
| Queue Length 95th (ft)  | 92                                                                                | 93                                                                                |                                                                                   | 77                                                                                | 49                                                                                | 26                                                                                | 29                                                                                  | 125                                                                                 | 17                                                                                  | 111                                                                                 | 278                                                                                 |                                                                                     |

# Bismarck Exit 161 Operational Study

# 1: Divide Ave & N Bismarck Expy

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 291                                                                               |                                                                                   |                                                                                   | 261                                                                               |                                                                                   |                                                                                     | 534                                                                                 |                                                                                     |                                                                                     | 378                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 150                                                                               |                                                                                   |                                                                                   | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                 |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 320                                                                               | 482                                                                               |                                                                                   | 251                                                                               | 433                                                                               | 601                                                                               | 120                                                                                 | 1736                                                                                | 763                                                                                 | 720                                                                                 | 2471                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 10                                                                                  | 112                                                                                 |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.37                                                                              | 0.38                                                                              |                                                                                   | 0.32                                                                              | 0.16                                                                              | 0.33                                                                              | 0.33                                                                                | 0.28                                                                                | 0.13                                                                                | 0.60                                                                                | 0.73                                                                                |                                                                                     |

## Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 1 (1%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.70

Intersection Signal Delay: 15.1

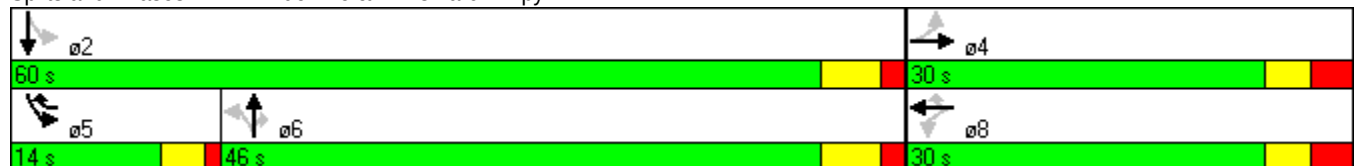
Intersection LOS: B

Intersection Capacity Utilization 65.8%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 1: Divide Ave & N Bismarck Expy



## Bismarck Exit 161 Operational Study

## 2: South Ramp &amp; Centennial Rd

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |                                                                                   |  |                                                                                   |                                                                                   |                                                                                   |                                                                                     |  |  |  |  |  |
| Volume (vph)            | 96                                                                                | 0                                                                                 | 389                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 564                                                                                 | 82                                                                                  | 23                                                                                  | 906                                                                                 | 0                                                                                   |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 0                                                                                 |                                                                                   | 175                                                                               | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                   |                                                                                     | 0                                                                                   | 222                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 1                                                                                 |                                                                                   | 1                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                   |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 300                                                                               | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                  |                                                                                     | 25                                                                                  | 150                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 575                                                                               |                                                                                   |                                                                                   | 383                                                                               |                                                                                   |                                                                                     | 458                                                                                 |                                                                                     |                                                                                     | 769                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 13.1                                                                              |                                                                                   |                                                                                   | 8.7                                                                               |                                                                                   |                                                                                     | 7.8                                                                                 |                                                                                     |                                                                                     | 13.1                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.83                                                                              | 0.92                                                                              | 0.71                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.87                                                                                | 0.87                                                                                | 0.82                                                                                | 0.52                                                                                | 0.78                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 4%                                                                                | 0%                                                                                | 3%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 0%                                                                                  | 13%                                                                                 | 29%                                                                                 | 13%                                                                                 | 2%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 116                                                                               | 0                                                                                 | 548                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 648                                                                                 | 100                                                                                 | 44                                                                                  | 1162                                                                                | 0                                                                                   |
| Turn Type               | custom                                                                            |                                                                                   | custom                                                                            |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     | Perm                                                                                | Perm                                                                                |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     | 6                                                                                   | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 6                                                                                   | 6                                                                                   | 2                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               |                                                                                   | 6.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 21.1                                                                              |                                                                                   | 21.1                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 23.4                                                                                | 23.4                                                                                | 21.4                                                                                | 21.4                                                                                |                                                                                     |
| Total Split (s)         | 35.0                                                                              | 0.0                                                                               | 35.0                                                                              | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 55.0                                                                                | 55.0                                                                                | 55.0                                                                                | 55.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 38.9%                                                                             | 0.0%                                                                              | 38.9%                                                                             | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                                | 61.1%                                                                               | 61.1%                                                                               | 61.1%                                                                               | 61.1%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.6                                                                               |                                                                                   | 3.6                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 1.5                                                                               |                                                                                   | 1.5                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 1.5                                                                                 | 1.5                                                                                 | 1.5                                                                                 | 1.5                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 5.1                                                                               | 4.0                                                                               | 5.1                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                                 | 5.4                                                                                 | 5.4                                                                                 | 5.4                                                                                 | 5.4                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Recall Mode             | None                                                                              |                                                                                   | None                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               |                                                                                     |
| Act Effct Green (s)     | 30.2                                                                              |                                                                                   | 30.2                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 49.3                                                                                | 49.3                                                                                | 49.3                                                                                | 49.3                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.34                                                                              |                                                                                   | 0.34                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 0.55                                                                                | 0.55                                                                                | 0.55                                                                                | 0.55                                                                                |                                                                                     |
| v/c Ratio               | 0.20                                                                              |                                                                                   | 0.96                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 0.37                                                                                | 0.14                                                                                | 0.13                                                                                | 0.60                                                                                |                                                                                     |
| Control Delay           | 22.6                                                                              |                                                                                   | 57.7                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 10.3                                                                                | 2.5                                                                                 | 8.4                                                                                 | 10.8                                                                                |                                                                                     |
| Queue Delay             | 0.0                                                                               |                                                                                   | 4.3                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.1                                                                                 |                                                                                     |
| Total Delay             | 22.6                                                                              |                                                                                   | 62.0                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 10.3                                                                                | 2.5                                                                                 | 8.4                                                                                 | 10.9                                                                                |                                                                                     |
| LOS                     | C                                                                                 |                                                                                   | E                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                     | B                                                                                   | A                                                                                   | A                                                                                   | B                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 9.3                                                                                 |                                                                                     |                                                                                     | 10.8                                                                                |                                                                                     |
| Approach LOS            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     | A                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 47                                                                                |                                                                                   | 275                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 54                                                                                  | 1                                                                                   | 6                                                                                   | 88                                                                                  |                                                                                     |
| Queue Length 95th (ft)  | 80                                                                                |                                                                                   | 287                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 81                                                                                  | 11                                                                                  | m5                                                                                  | m69                                                                                 |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 495                                                                               |                                                                                   |                                                                                   | 303                                                                               |                                                                                   |                                                                                    | 378                                                                                 |                                                                                     |                                                                                     | 689                                                                                 |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   | 175                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | 222                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 582                                                                               |                                                                                   | 568                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 1761                                                                                | 735                                                                                 | 344                                                                                 | 1950                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 |                                                                                   | 13                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 73                                                                                  |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.20                                                                              |                                                                                   | 0.99                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.37                                                                                | 0.14                                                                                | 0.13                                                                                | 0.62                                                                                |                                                                                     |

**Intersection Summary**

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 2 (2%), Referenced to phase 2:SBTL and 6:NBT, Start of Green

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.96

Intersection Signal Delay: 21.6

Intersection LOS: C

Intersection Capacity Utilization 82.9%

ICU Level of Service E

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: South Ramp &amp; Centennial Rd

|                                                                                        |                                                                                        |
|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
|  ø2  |  ø4 |
| 55 s                                                                                   | 35 s                                                                                   |
|  ø6 |                                                                                        |
| 55 s                                                                                   |                                                                                        |

## Bismarck Exit 161 Operational Study

## 3: North Ramp &amp; Centennial Rd

|                         |  |  |  |  |  |  |   |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |                                                                                   |                                                                                   |                                                                                   |  |                                                                                   |  |  |  |                                                                                     |                                                                                     |  |  |
| Volume (vph)            | 0                                                                                 | 0                                                                                 | 0                                                                                 | 91                                                                                | 0                                                                                 | 9                                                                                 | 331                                                                                 | 425                                                                                 | 0                                                                                   | 0                                                                                   | 1361                                                                                | 304                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 16                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 150                                                                               | 215                                                                                 |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   |
| Storage Lanes           | 0                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 100                                                                               | 150                                                                                 |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 270                                                                               |                                                                                   |                                                                                   | 465                                                                               |                                                                                   |                                                                                     | 769                                                                                 |                                                                                     |                                                                                     | 779                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 6.1                                                                               |                                                                                   |                                                                                   | 10.6                                                                              |                                                                                   |                                                                                     | 13.1                                                                                |                                                                                     |                                                                                     | 13.3                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.73                                                                              | 0.92                                                                              | 0.56                                                                              | 0.94                                                                                | 0.76                                                                                | 0.92                                                                                | 0.92                                                                                | 0.77                                                                                | 0.68                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                | 2%                                                                                | 2%                                                                                | 10%                                                                               | 2%                                                                                | 33%                                                                               | 7%                                                                                  | 4%                                                                                  | 2%                                                                                  | 2%                                                                                  | 1%                                                                                  | 1%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 125                                                                               | 0                                                                                 | 16                                                                                | 352                                                                                 | 559                                                                                 | 0                                                                                   | 0                                                                                   | 2215                                                                                | 0                                                                                   |
| Turn Type               |                                                                                   |                                                                                   |                                                                                   | custom                                                                            |                                                                                   | custom                                                                            | pm+pt                                                                               |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        |                                                                                   |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Detector Phase          |                                                                                   |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 8                                                                                 | 1                                                                                   | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     |                                                                                   |                                                                                   |                                                                                   | 5.0                                                                               |                                                                                   | 5.0                                                                               | 5.0                                                                                 | 10.0                                                                                |                                                                                     |                                                                                     | 10.0                                                                                |                                                                                     |
| Minimum Split (s)       |                                                                                   |                                                                                   |                                                                                   | 20.0                                                                              |                                                                                   | 20.0                                                                              | 9.0                                                                                 | 20.0                                                                                |                                                                                     |                                                                                     | 22.4                                                                                |                                                                                     |
| Total Split (s)         | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 33.0                                                                              | 0.0                                                                               | 33.0                                                                              | 15.0                                                                                | 57.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 42.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                              | 36.7%                                                                             | 0.0%                                                                              | 36.7%                                                                             | 16.7%                                                                               | 63.3%                                                                               | 0.0%                                                                                | 0.0%                                                                                | 46.7%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         |                                                                                   |                                                                                   |                                                                                   | 3.2                                                                               |                                                                                   | 3.2                                                                               | 3.0                                                                                 | 3.9                                                                                 |                                                                                     |                                                                                     | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        |                                                                                   |                                                                                   |                                                                                   | 2.0                                                                               |                                                                                   | 2.0                                                                               | 1.0                                                                                 | 1.5                                                                                 |                                                                                     |                                                                                     | 1.5                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 5.2                                                                               | 4.0                                                                               | 5.2                                                                               | 4.0                                                                                 | 5.4                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 5.4                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lead                                                                                |                                                                                     |                                                                                     |                                                                                     | Lag                                                                                 |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                                 |                                                                                     |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |
| Recall Mode             |                                                                                   |                                                                                   |                                                                                   | None                                                                              |                                                                                   | None                                                                              | None                                                                                | C-Min                                                                               |                                                                                     |                                                                                     | C-Min                                                                               |                                                                                     |
| Act Effect Green (s)    |                                                                                   |                                                                                   |                                                                                   | 10.5                                                                              |                                                                                   | 10.5                                                                              | 70.3                                                                                | 68.9                                                                                |                                                                                     |                                                                                     | 39.4                                                                                |                                                                                     |
| Actuated g/C Ratio      |                                                                                   |                                                                                   |                                                                                   | 0.12                                                                              |                                                                                   | 0.12                                                                              | 0.78                                                                                | 0.77                                                                                |                                                                                     |                                                                                     | 0.44                                                                                |                                                                                     |
| v/c Ratio               |                                                                                   |                                                                                   |                                                                                   | 0.58                                                                              |                                                                                   | 0.10                                                                              | 0.63                                                                                | 0.21                                                                                |                                                                                     |                                                                                     | 1.44                                                                                |                                                                                     |
| Control Delay           |                                                                                   |                                                                                   |                                                                                   | 47.5                                                                              |                                                                                   | 16.7                                                                              | 34.1                                                                                | 2.3                                                                                 |                                                                                     |                                                                                     | 223.4                                                                               |                                                                                     |
| Queue Delay             |                                                                                   |                                                                                   |                                                                                   | 0.0                                                                               |                                                                                   | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |                                                                                     | 0.0                                                                                 |                                                                                     |
| Total Delay             |                                                                                   |                                                                                   |                                                                                   | 47.5                                                                              |                                                                                   | 16.7                                                                              | 34.1                                                                                | 2.3                                                                                 |                                                                                     |                                                                                     | 223.4                                                                               |                                                                                     |
| LOS                     |                                                                                   |                                                                                   |                                                                                   | D                                                                                 |                                                                                   | B                                                                                 | C                                                                                   | A                                                                                   |                                                                                     |                                                                                     | F                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 14.6                                                                                |                                                                                     |                                                                                     | 223.4                                                                               |                                                                                     |
| Approach LOS            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     | B                                                                                   |                                                                                     |                                                                                     | F                                                                                   |                                                                                     |
| Queue Length 50th (ft)  |                                                                                   |                                                                                   |                                                                                   | 68                                                                                |                                                                                   | 0                                                                                 | 164                                                                                 | 26                                                                                  |                                                                                     |                                                                                     | ~879                                                                                |                                                                                     |
| Queue Length 95th (ft)  |                                                                                   |                                                                                   |                                                                                   | 93                                                                                |                                                                                   | 8                                                                                 | 255                                                                                 | 28                                                                                  |                                                                                     |                                                                                     | m#596                                                                               |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 190                                                                               |                                                                                   |                                                                                   | 385                                                                               |                                                                                   |                                                                                    | 689                                                                                 |                                                                                     |                                                                                     | 699                                                                                 |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 150                                                                               | 215                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Base Capacity (vph)     |                                                                                   |                                                                                   |                                                                                   | 575                                                                               |                                                                                   | 386                                                                               | 560                                                                                | 2657                                                                                |                                                                                     |                                                                                     | 1540                                                                                |                                                                                     |
| Starvation Cap Reductn  |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     |                                                                                     | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     |                                                                                     | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     |                                                                                     | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       |                                                                                   |                                                                                   |                                                                                   | 0.22                                                                              |                                                                                   | 0.04                                                                              | 0.63                                                                               | 0.21                                                                                |                                                                                     |                                                                                     | 1.44                                                                                |                                                                                     |

**Intersection Summary**

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 9 (10%), Referenced to phase 2:SBT and 6:NBTL, Start of Green

Natural Cycle: 150

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.44

Intersection Signal Delay: 157.4

Intersection LOS: F

Intersection Capacity Utilization 82.9%

ICU Level of Service E

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: North Ramp &amp; Centennial Rd



|                                   |  |  |  |  |  |  |   |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |                                                                                   |  |  |                                                                                   |  |  |  |  |  |                                                                                     |  |  |
| Volume (veh/h)                    | 6                                                                                 | 1                                                                                 | 181                                                                               | 76                                                                                | 4                                                                                 | 34                                                                                | 63                                                                                  | 352                                                                                 | 83                                                                                  | 17                                                                                  | 1334                                                                                | 22                                                                                  |
| Sign Control                      |                                                                                   | Stop                                                                              |                                                                                   |                                                                                   | Stop                                                                              |                                                                                   |                                                                                     | Free                                                                                |                                                                                     |                                                                                     | Free                                                                                |                                                                                     |
| Grade                             |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Peak Hour Factor                  | 0.38                                                                              | 0.25                                                                              | 0.71                                                                              | 0.63                                                                              | 0.50                                                                              | 0.77                                                                              | 0.79                                                                                | 0.73                                                                                | 0.55                                                                                | 0.71                                                                                | 0.78                                                                                | 0.79                                                                                |
| Hourly flow rate (vph)            | 16                                                                                | 4                                                                                 | 255                                                                               | 121                                                                               | 8                                                                                 | 44                                                                                | 80                                                                                  | 482                                                                                 | 151                                                                                 | 24                                                                                  | 1710                                                                                | 28                                                                                  |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Width (ft)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Walking Speed (ft/s)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Right turn flare (veh)            |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Median type                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     | None                                                                                |                                                                                     |                                                                                     | None                                                                                |                                                                                     |
| Median storage (veh)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Upstream signal (ft)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 779                                                                                 |                                                                                     |                                                                                     | 1314                                                                                |                                                                                     |
| pX, platoon unblocked             | 0.25                                                                              | 0.25                                                                              | 0.23                                                                              | 0.25                                                                              | 0.25                                                                              | 0.97                                                                              | 0.23                                                                                |                                                                                     |                                                                                     | 0.97                                                                                |                                                                                     |                                                                                     |
| vC, conflicting volume            | 2426                                                                              | 2551                                                                              | 1710                                                                              | 2402                                                                              | 2428                                                                              | 482                                                                               | 1738                                                                                |                                                                                     |                                                                                     | 633                                                                                 |                                                                                     |                                                                                     |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vCu, unblocked vol                | 4891                                                                              | 5389                                                                              | 2399                                                                              | 4795                                                                              | 4898                                                                              | 447                                                                               | 2518                                                                                |                                                                                     |                                                                                     | 603                                                                                 |                                                                                     |                                                                                     |
| tC, single (s)                    | 7.3                                                                               | 6.5                                                                               | 6.2                                                                               | 7.1                                                                               | 6.5                                                                               | 6.2                                                                               | 4.2                                                                                 |                                                                                     |                                                                                     | 4.2                                                                                 |                                                                                     |                                                                                     |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| tF (s)                            | 3.7                                                                               | 4.0                                                                               | 3.3                                                                               | 3.5                                                                               | 4.0                                                                               | 3.3                                                                               | 2.3                                                                                 |                                                                                     |                                                                                     | 2.3                                                                                 |                                                                                     |                                                                                     |
| p0 queue free %                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 93                                                                                | 0                                                                                   |                                                                                     |                                                                                     | 97                                                                                  |                                                                                     |                                                                                     |
| cM capacity (veh/h)               | 0                                                                                 | 0                                                                                 | 10                                                                                | 0                                                                                 | 0                                                                                 | 595                                                                               | 39                                                                                  |                                                                                     |                                                                                     | 896                                                                                 |                                                                                     |                                                                                     |
| Direction, Lane #                 | EB 1                                                                              | WB 1                                                                              | NB 1                                                                              | NB 2                                                                              | NB 3                                                                              | SB 1                                                                              | SB 2                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Total                      | 275                                                                               | 173                                                                               | 80                                                                                | 482                                                                               | 151                                                                               | 1734                                                                              | 28                                                                                  |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Left                       | 16                                                                                | 121                                                                               | 80                                                                                | 0                                                                                 | 0                                                                                 | 24                                                                                | 0                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Right                      | 255                                                                               | 44                                                                                | 0                                                                                 | 0                                                                                 | 151                                                                               | 0                                                                                 | 28                                                                                  |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| cSH                               | 0                                                                                 | 0                                                                                 | 39                                                                                | 1700                                                                              | 1700                                                                              | 896                                                                               | 1700                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume to Capacity                | Err                                                                               | Err                                                                               | 2.04                                                                              | 0.28                                                                              | 0.09                                                                              | 0.03                                                                              | 0.02                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Queue Length 95th (ft)            | Err                                                                               | Err                                                                               | 214                                                                               | 0                                                                                 | 0                                                                                 | 2                                                                                 | 0                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Control Delay (s)                 | Err                                                                               | Err                                                                               | 704.8                                                                             | 0.0                                                                               | 0.0                                                                               | 0.1                                                                               | 0.0                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane LOS                          | F                                                                                 | F                                                                                 | F                                                                                 |                                                                                   |                                                                                   | A                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach Delay (s)                | Err                                                                               | Err                                                                               | 78.8                                                                              |                                                                                   |                                                                                   | 0.1                                                                               |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach LOS                      | F                                                                                 | F                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Average Delay                     |                                                                                   |                                                                                   | Err                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 101.5%                                                                            |                                                                                   | ICU Level of Service                                                              |                                                                                   |                                                                                     |                                                                                     | G                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |                                                                                   |  |  |                                                                                   |  |  |                                                                                     |  |  |                                                                                     |
| Volume (vph)            | 17                                                                                | 23                                                                                | 150                                                                               | 570                                                                               | 236                                                                               | 31                                                                                | 110                                                                                 | 241                                                                                 | 43                                                                                  | 20                                                                                  | 867                                                                                 | 78                                                                                  |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 100                                                                               |                                                                                   | 0                                                                                 | 500                                                                               |                                                                                   | 0                                                                                 | 150                                                                                 |                                                                                     | 0                                                                                   | 80                                                                                  |                                                                                     | 0                                                                                   |
| Storage Lanes           | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                   |                                                                                     | 0                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                  |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 35                                                                                |                                                                                   |                                                                                   | 35                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 1317                                                                              |                                                                                   |                                                                                   | 1255                                                                              |                                                                                   |                                                                                     | 274                                                                                 |                                                                                     |                                                                                     | 497                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 25.7                                                                              |                                                                                   |                                                                                   | 24.4                                                                              |                                                                                   |                                                                                     | 4.7                                                                                 |                                                                                     |                                                                                     | 8.5                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.47                                                                              | 0.72                                                                              | 0.66                                                                              | 0.80                                                                              | 0.62                                                                              | 0.48                                                                              | 0.76                                                                                | 0.71                                                                                | 0.60                                                                                | 0.71                                                                                | 0.81                                                                                | 0.78                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 0%                                                                                | 0%                                                                                | 0%                                                                                | 0%                                                                                | 1%                                                                                | 3%                                                                                | 5%                                                                                  | 5%                                                                                  | 0%                                                                                  | 0%                                                                                  | 2%                                                                                  | 3%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 36                                                                                | 259                                                                               | 0                                                                                 | 712                                                                               | 446                                                                               | 0                                                                                 | 145                                                                                 | 411                                                                                 | 0                                                                                   | 28                                                                                  | 1170                                                                                | 0                                                                                   |
| Turn Type               | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                                |                                                                                     |                                                                                     | Perm                                                                                |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   |                                                                                     | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   |                                                                                   | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 | 4                                                                                 |                                                                                   | 8                                                                                 | 8                                                                                 |                                                                                   | 6                                                                                   | 6                                                                                   |                                                                                     | 2                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 10.0                                                                              | 10.0                                                                              |                                                                                   | 10.0                                                                              | 10.0                                                                              |                                                                                   | 6.0                                                                                 | 6.0                                                                                 |                                                                                     | 6.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 15.7                                                                              | 15.7                                                                              |                                                                                   | 15.7                                                                              | 15.7                                                                              |                                                                                   | 11.5                                                                                | 11.5                                                                                |                                                                                     | 11.5                                                                                | 11.5                                                                                |                                                                                     |
| Total Split (s)         | 45.0                                                                              | 45.0                                                                              | 0.0                                                                               | 45.0                                                                              | 45.0                                                                              | 0.0                                                                               | 45.0                                                                                | 45.0                                                                                | 0.0                                                                                 | 45.0                                                                                | 45.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 50.0%                                                                             | 50.0%                                                                             | 0.0%                                                                              | 50.0%                                                                             | 50.0%                                                                             | 0.0%                                                                              | 50.0%                                                                               | 50.0%                                                                               | 0.0%                                                                                | 50.0%                                                                               | 50.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.9                                                                               | 3.9                                                                               |                                                                                   | 3.9                                                                               | 3.9                                                                               |                                                                                   | 3.6                                                                                 | 3.6                                                                                 |                                                                                     | 3.6                                                                                 | 3.6                                                                                 |                                                                                     |
| All-Red Time (s)        | 1.8                                                                               | 1.8                                                                               |                                                                                   | 1.8                                                                               | 1.8                                                                               |                                                                                   | 1.9                                                                                 | 1.9                                                                                 |                                                                                     | 1.9                                                                                 | 1.9                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 5.7                                                                               | 5.7                                                                               | 4.0                                                                               | 5.7                                                                               | 5.7                                                                               | 4.0                                                                               | 5.5                                                                                 | 5.5                                                                                 | 4.0                                                                                 | 5.5                                                                                 | 5.5                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Recall Mode             | Max                                                                               | Max                                                                               |                                                                                   | Max                                                                               | Max                                                                               |                                                                                   | C-Max                                                                               | C-Max                                                                               |                                                                                     | C-Max                                                                               | C-Max                                                                               |                                                                                     |
| Act Effect Green (s)    | 39.3                                                                              | 39.3                                                                              |                                                                                   | 39.3                                                                              | 39.3                                                                              |                                                                                   | 39.5                                                                                | 39.5                                                                                |                                                                                     | 39.5                                                                                | 39.5                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.44                                                                              | 0.44                                                                              |                                                                                   | 0.44                                                                              | 0.44                                                                              |                                                                                   | 0.44                                                                                | 0.44                                                                                |                                                                                     | 0.44                                                                                | 0.44                                                                                |                                                                                     |
| v/c Ratio               | 0.12                                                                              | 0.35                                                                              |                                                                                   | 1.54                                                                              | 0.55                                                                              |                                                                                   | 1.81                                                                                | 0.52                                                                                |                                                                                     | 0.08                                                                                | 1.44                                                                                |                                                                                     |
| Control Delay           | 16.5                                                                              | 15.6                                                                              |                                                                                   | 279.9                                                                             | 21.5                                                                              |                                                                                   | 435.1                                                                               | 25.6                                                                                |                                                                                     | 15.7                                                                                | 231.7                                                                               |                                                                                     |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                                 | 0.0                                                                                 |                                                                                     | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |
| Total Delay             | 16.5                                                                              | 15.6                                                                              |                                                                                   | 279.9                                                                             | 21.5                                                                              |                                                                                   | 435.1                                                                               | 25.6                                                                                |                                                                                     | 15.7                                                                                | 231.7                                                                               |                                                                                     |
| LOS                     | B                                                                                 | B                                                                                 |                                                                                   | F                                                                                 | C                                                                                 |                                                                                   | F                                                                                   | C                                                                                   |                                                                                     | B                                                                                   | F                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 15.7                                                                              |                                                                                   |                                                                                   | 180.4                                                                             |                                                                                   |                                                                                     | 132.4                                                                               |                                                                                     |                                                                                     | 226.7                                                                               |                                                                                     |
| Approach LOS            |                                                                                   | B                                                                                 |                                                                                   |                                                                                   | F                                                                                 |                                                                                   |                                                                                     | F                                                                                   |                                                                                     |                                                                                     | F                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 12                                                                                | 78                                                                                |                                                                                   | ~575                                                                              | 177                                                                               |                                                                                   | ~130                                                                                | 166                                                                                 |                                                                                     | 9                                                                                   | ~922                                                                                |                                                                                     |
| Queue Length 95th (ft)  | 15                                                                                | 99                                                                                |                                                                                   | #671                                                                              | 160                                                                               |                                                                                   | #203                                                                                | 184                                                                                 |                                                                                     | 20                                                                                  | #1002                                                                               |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 1237                                                                              |                                                                                   |                                                                                   | 1175                                                                              |                                                                                   |                                                                                    | 194                                                                                 |                                                                                     |                                                                                     | 417                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 100                                                                               |                                                                                   |                                                                                   | 500                                                                               |                                                                                   |                                                                                   | 150                                                                                |                                                                                     |                                                                                     | 80                                                                                  |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 301                                                                               | 744                                                                               |                                                                                   | 461                                                                               | 808                                                                               |                                                                                   | 80                                                                                 | 788                                                                                 |                                                                                     | 331                                                                                 | 810                                                                                 |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.12                                                                              | 0.35                                                                              |                                                                                   | 1.54                                                                              | 0.55                                                                              |                                                                                   | 1.81                                                                               | 0.52                                                                                |                                                                                     | 0.08                                                                                | 1.44                                                                                |                                                                                     |

**Intersection Summary**

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.81

Intersection Signal Delay: 174.2

Intersection LOS: F

Intersection Capacity Utilization 117.2%

ICU Level of Service H

Analysis Period (min) 15

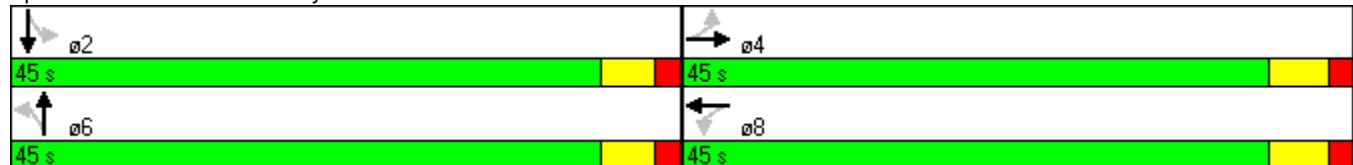
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 5: Century Ave &amp; Centennial Rd



## **Appendix E: 2009 - Existing Conditions PM (1A2)**

## Bismarck Exit 161 Operational Study

## 1: Divide Ave &amp; N Bismarck Expy

|                         |  |  |  |  |  |  |   |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |                                                                                   |  |  |  |  |  |  |  |  |  |
| Volume (vph)            | 231                                                                               | 45                                                                                | 20                                                                                | 55                                                                                | 45                                                                                | 201                                                                               | 24                                                                                  | 854                                                                                 | 60                                                                                  | 183                                                                                 | 779                                                                                 | 118                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 150                                                                               |                                                                                   | 0                                                                                 | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                 |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                   |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 100                                                                               |                                                                                   | 25                                                                                | 100                                                                               |                                                                                   | 100                                                                               | 100                                                                                 |                                                                                     | 150                                                                                 | 100                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 25                                                                                |                                                                                   |                                                                                   | 25                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 371                                                                               |                                                                                   |                                                                                   | 341                                                                               |                                                                                   |                                                                                     | 614                                                                                 |                                                                                     |                                                                                     | 468                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 10.1                                                                              |                                                                                   |                                                                                   | 9.3                                                                               |                                                                                   |                                                                                     | 10.5                                                                                |                                                                                     |                                                                                     | 8.0                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.85                                                                              | 0.80                                                                              | 0.63                                                                              | 0.63                                                                              | 0.56                                                                              | 0.75                                                                              | 0.75                                                                                | 0.80                                                                                | 0.83                                                                                | 0.88                                                                                | 0.87                                                                                | 0.87                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 1%                                                                                | 2%                                                                                | 0%                                                                                | 18%                                                                               | 7%                                                                                | 14%                                                                               | 8%                                                                                  | 2%                                                                                  | 10%                                                                                 | 10%                                                                                 | 4%                                                                                  | 4%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 272                                                                               | 88                                                                                | 0                                                                                 | 87                                                                                | 80                                                                                | 268                                                                               | 32                                                                                  | 1068                                                                                | 72                                                                                  | 208                                                                                 | 1031                                                                                | 0                                                                                   |
| Turn Type               | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                              |                                                                                   | pm+ov                                                                             | Perm                                                                                |                                                                                     | Perm                                                                                | pm+pt                                                                               |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 | 5                                                                                 |                                                                                     | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                   |                                                                                     | 6                                                                                   | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 | 4                                                                                 |                                                                                   | 8                                                                                 | 8                                                                                 | 5                                                                                 | 6                                                                                   | 6                                                                                   | 6                                                                                   | 5                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               | 6.0                                                                               |                                                                                   | 6.0                                                                               | 6.0                                                                               | 5.0                                                                               | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 5.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 30.0                                                                              | 30.0                                                                              |                                                                                   | 30.0                                                                              | 30.0                                                                              | 9.8                                                                               | 22.9                                                                                | 22.9                                                                                | 22.9                                                                                | 9.8                                                                                 | 28.7                                                                                |                                                                                     |
| Total Split (s)         | 30.0                                                                              | 30.0                                                                              | 0.0                                                                               | 30.0                                                                              | 30.0                                                                              | 14.0                                                                              | 46.0                                                                                | 46.0                                                                                | 46.0                                                                                | 14.0                                                                                | 60.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 33.3%                                                                             | 33.3%                                                                             | 0.0%                                                                              | 33.3%                                                                             | 33.3%                                                                             | 15.6%                                                                             | 51.1%                                                                               | 51.1%                                                                               | 51.1%                                                                               | 15.6%                                                                               | 66.7%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 3.0                                                                               | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 | 3.0                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 1.0                                                                               | 1.8                                                                                 | 1.8                                                                                 | 1.8                                                                                 | 1.0                                                                                 | 1.8                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 5.7                                                                                 | 5.7                                                                                 | 5.7                                                                                 | 4.0                                                                                 | 5.7                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lead                                                                              | Lag                                                                                 | Lag                                                                                 | Lag                                                                                 | Lag                                                                                 | Lead                                                                                |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                               | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 |                                                                                     |
| Recall Mode             | None                                                                              | None                                                                              |                                                                                   | None                                                                              | None                                                                              | None                                                                              | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               | None                                                                                | C-Min                                                                               |                                                                                     |
| Act Effect Green (s)    | 21.6                                                                              | 21.6                                                                              |                                                                                   | 21.6                                                                              | 21.6                                                                              | 36.9                                                                              | 43.4                                                                                | 43.4                                                                                | 43.4                                                                                | 58.4                                                                                | 56.7                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.24                                                                              | 0.24                                                                              |                                                                                   | 0.24                                                                              | 0.24                                                                              | 0.41                                                                              | 0.48                                                                                | 0.48                                                                                | 0.48                                                                                | 0.65                                                                                | 0.63                                                                                |                                                                                     |
| v/c Ratio               | 0.85                                                                              | 0.20                                                                              |                                                                                   | 0.32                                                                              | 0.19                                                                              | 0.44                                                                              | 0.14                                                                                | 0.63                                                                                | 0.10                                                                                | 0.65                                                                                | 0.48                                                                                |                                                                                     |
| Control Delay           | 57.3                                                                              | 18.8                                                                              |                                                                                   | 30.7                                                                              | 27.2                                                                              | 17.6                                                                              | 16.6                                                                                | 20.1                                                                                | 4.1                                                                                 | 23.4                                                                                | 7.5                                                                                 |                                                                                     |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.1                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.2                                                                                 |                                                                                     |
| Total Delay             | 57.3                                                                              | 18.8                                                                              |                                                                                   | 30.7                                                                              | 27.2                                                                              | 17.6                                                                              | 16.6                                                                                | 20.2                                                                                | 4.1                                                                                 | 23.4                                                                                | 7.6                                                                                 |                                                                                     |
| LOS                     | E                                                                                 | B                                                                                 |                                                                                   | C                                                                                 | C                                                                                 | B                                                                                 | B                                                                                   | C                                                                                   | A                                                                                   | C                                                                                   | A                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 47.9                                                                              |                                                                                   |                                                                                   | 22.0                                                                              |                                                                                   |                                                                                     | 19.1                                                                                |                                                                                     |                                                                                     | 10.3                                                                                |                                                                                     |
| Approach LOS            |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | C                                                                                 |                                                                                   |                                                                                     | B                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 143                                                                               | 25                                                                                |                                                                                   | 39                                                                                | 35                                                                                | 82                                                                                | 10                                                                                  | 244                                                                                 | 0                                                                                   | 52                                                                                  | 127                                                                                 |                                                                                     |
| Queue Length 95th (ft)  | #239                                                                              | 53                                                                                |                                                                                   | 54                                                                                | 43                                                                                | 111                                                                               | 24                                                                                  | 263                                                                                 | 19                                                                                  | 108                                                                                 | 133                                                                                 |                                                                                     |

# Bismarck Exit 161 Operational Study

# 1: Divide Ave & N Bismarck Expy



| Lane Group              | EBL  | EBT  | EBR | WBL  | WBT  | WBR  | NBL  | NBT  | NBR  | SBL  | SBT  | SBR |
|-------------------------|------|------|-----|------|------|------|------|------|------|------|------|-----|
| Internal Link Dist (ft) |      | 291  |     |      | 261  |      |      | 534  |      |      | 388  |     |
| Turn Bay Length (ft)    | 150  |      |     | 110  |      | 100  | 400  |      | 200  | 400  |      |     |
| Base Capacity (vph)     | 354  | 496  |     | 301  | 474  | 618  | 236  | 1708 | 745  | 329  | 2154 |     |
| Starvation Cap Reductn  | 0    | 0    |     | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 356  |     |
| Spillback Cap Reductn   | 0    | 0    |     | 0    | 0    | 0    | 0    | 54   | 0    | 0    | 0    |     |
| Storage Cap Reductn     | 0    | 0    |     | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |     |
| Reduced v/c Ratio       | 0.77 | 0.18 |     | 0.29 | 0.17 | 0.43 | 0.14 | 0.65 | 0.10 | 0.63 | 0.57 |     |

## Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 1 (1%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.85

Intersection Signal Delay: 19.3

Intersection LOS: B

Intersection Capacity Utilization 66.3%

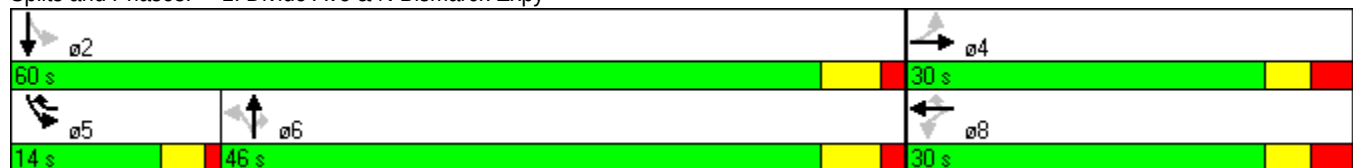
ICU Level of Service C

Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 1: Divide Ave & N Bismarck Expy



## Bismarck Exit 161 Operational Study

## 2: South Ramp &amp; N Bismarck Expy

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |                                                                                   |  |                                                                                   |                                                                                   |                                                                                   |                                                                                    |  |  |  |  |  |
| Volume (vph)            | 213                                                                               | 0                                                                                 | 286                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 1134                                                                                | 111                                                                                 | 27                                                                                  | 557                                                                                 | 0                                                                                   |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 16                                                                                | 12                                                                                | 12                                                                                | 12                                                                                 | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 0                                                                                 |                                                                                   | 175                                                                               | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  |                                                                                     | 0                                                                                   | 222                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 1                                                                                 |                                                                                   | 1                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 300                                                                               | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                 |                                                                                     | 25                                                                                  | 150                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                    |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                    | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 575                                                                               |                                                                                   |                                                                                   | 383                                                                               |                                                                                   |                                                                                    | 468                                                                                 |                                                                                     |                                                                                     | 759                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 13.1                                                                              |                                                                                   |                                                                                   | 8.7                                                                               |                                                                                   |                                                                                    | 8.0                                                                                 |                                                                                     |                                                                                     | 12.9                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.73                                                                              | 0.92                                                                              | 0.78                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                               | 0.83                                                                                | 0.79                                                                                | 0.61                                                                                | 0.97                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                               | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 3%                                                                                | 2%                                                                                | 12%                                                                               | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                 | 2%                                                                                  | 16%                                                                                 | 7%                                                                                  | 10%                                                                                 | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 292                                                                               | 0                                                                                 | 367                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 1366                                                                                | 141                                                                                 | 44                                                                                  | 574                                                                                 | 0                                                                                   |
| Turn Type               | custom                                                                            |                                                                                   | custom                                                                            |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     | Perm                                                                                | Perm                                                                                |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     | 6                                                                                   | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                   | 6                                                                                   | 2                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               |                                                                                   | 6.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 21.1                                                                              |                                                                                   | 21.1                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 23.4                                                                                | 23.4                                                                                | 21.4                                                                                | 21.4                                                                                |                                                                                     |
| Total Split (s)         | 35.0                                                                              | 0.0                                                                               | 35.0                                                                              | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 55.0                                                                                | 55.0                                                                                | 55.0                                                                                | 55.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 38.9%                                                                             | 0.0%                                                                              | 38.9%                                                                             | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                               | 61.1%                                                                               | 61.1%                                                                               | 61.1%                                                                               | 61.1%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.6                                                                               |                                                                                   | 3.6                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 1.5                                                                               |                                                                                   | 1.5                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 1.5                                                                                 | 1.5                                                                                 | 1.5                                                                                 | 1.5                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 5.1                                                                               | 4.0                                                                               | 5.1                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                                | 5.4                                                                                 | 5.4                                                                                 | 5.4                                                                                 | 5.4                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Recall Mode             | None                                                                              |                                                                                   | None                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               |                                                                                     |
| Act Effct Green (s)     | 20.6                                                                              |                                                                                   | 20.6                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 58.9                                                                                | 58.9                                                                                | 58.9                                                                                | 58.9                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.23                                                                              |                                                                                   | 0.23                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.65                                                                                | 0.65                                                                                | 0.65                                                                                | 0.65                                                                                |                                                                                     |
| v/c Ratio               | 0.73                                                                              |                                                                                   | 0.67                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.59                                                                                | 0.15                                                                                | 0.26                                                                                | 0.27                                                                                |                                                                                     |
| Control Delay           | 42.3                                                                              |                                                                                   | 13.9                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 8.2                                                                                 | 1.6                                                                                 | 7.6                                                                                 | 3.0                                                                                 |                                                                                     |
| Queue Delay             | 0.0                                                                               |                                                                                   | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.3                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |
| Total Delay             | 42.3                                                                              |                                                                                   | 13.9                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 8.6                                                                                 | 1.6                                                                                 | 7.6                                                                                 | 3.0                                                                                 |                                                                                     |
| LOS                     | D                                                                                 |                                                                                   | B                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | A                                                                                   | A                                                                                   | A                                                                                   | A                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 7.9                                                                                 |                                                                                     |                                                                                     | 3.3                                                                                 |                                                                                     |
| Approach LOS            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | A                                                                                   |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 155                                                                               |                                                                                   | 40                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 111                                                                                 | 0                                                                                   | 1                                                                                   | 4                                                                                   |                                                                                     |
| Queue Length 95th (ft)  | 166                                                                               |                                                                                   | 72                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 213                                                                                 | m11                                                                                 | 7                                                                                   | 39                                                                                  |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 495                                                                               |                                                                                   |                                                                                   | 303                                                                               |                                                                                   |                                                                                    | 388                                                                                 |                                                                                     |                                                                                     | 679                                                                                 |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   | 175                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | 222                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 582                                                                               |                                                                                   | 667                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 2317                                                                                | 960                                                                                 | 171                                                                                 | 2149                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 381                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.50                                                                              |                                                                                   | 0.55                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.71                                                                                | 0.15                                                                                | 0.26                                                                                | 0.27                                                                                |                                                                                     |

**Intersection Summary**

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 9 (10%), Referenced to phase 2:SBTL and 6:NBT, Start of Green

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.73

Intersection Signal Delay: 11.3

Intersection LOS: B

Intersection Capacity Utilization 61.4%

ICU Level of Service B

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: South Ramp &amp; N Bismarck Expy

|                                                                                        |                                                                                        |
|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
|  ø2  |  ø4 |
| 55 s                                                                                   | 35 s                                                                                   |
|  ø6 |                                                                                        |
| 55 s                                                                                   |                                                                                        |

## Bismarck Exit 161 Operational Study

## 3: North Ramp &amp; Centennial Rd

|                         |  |  |  |  |  |  |   |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |                                                                                   |                                                                                   |                                                                                   |  |                                                                                   |  |  |  |                                                                                     |                                                                                     |  |  |
| Volume (vph)            | 0                                                                                 | 0                                                                                 | 0                                                                                 | 99                                                                                | 0                                                                                 | 21                                                                                | 371                                                                                 | 1055                                                                                | 0                                                                                   | 0                                                                                   | 536                                                                                 | 149                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 16                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 150                                                                               | 215                                                                                 |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   |
| Storage Lanes           | 0                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 100                                                                               | 150                                                                                 |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 270                                                                               |                                                                                   |                                                                                   | 465                                                                               |                                                                                   |                                                                                     | 759                                                                                 |                                                                                     |                                                                                     | 795                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 6.1                                                                               |                                                                                   |                                                                                   | 10.6                                                                              |                                                                                   |                                                                                     | 12.9                                                                                |                                                                                     |                                                                                     | 13.6                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.85                                                                              | 0.25                                                                              | 0.48                                                                              | 0.69                                                                                | 0.93                                                                                | 0.92                                                                                | 0.92                                                                                | 0.96                                                                                | 0.93                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                | 2%                                                                                | 2%                                                                                | 20%                                                                               | 0%                                                                                | 0%                                                                                | 3%                                                                                  | 1%                                                                                  | 2%                                                                                  | 2%                                                                                  | 4%                                                                                  | 1%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 116                                                                               | 0                                                                                 | 44                                                                                | 538                                                                                 | 1134                                                                                | 0                                                                                   | 0                                                                                   | 718                                                                                 | 0                                                                                   |
| Turn Type               |                                                                                   |                                                                                   |                                                                                   | custom                                                                            |                                                                                   | custom                                                                            | pm+pt                                                                               |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        |                                                                                   |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Detector Phase          |                                                                                   |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 8                                                                                 | 1                                                                                   | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     |                                                                                   |                                                                                   |                                                                                   | 5.0                                                                               |                                                                                   | 5.0                                                                               | 5.0                                                                                 | 10.0                                                                                |                                                                                     |                                                                                     | 10.0                                                                                |                                                                                     |
| Minimum Split (s)       |                                                                                   |                                                                                   |                                                                                   | 20.0                                                                              |                                                                                   | 20.0                                                                              | 9.0                                                                                 | 20.0                                                                                |                                                                                     |                                                                                     | 22.4                                                                                |                                                                                     |
| Total Split (s)         | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 33.0                                                                              | 0.0                                                                               | 33.0                                                                              | 15.0                                                                                | 57.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 42.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                              | 36.7%                                                                             | 0.0%                                                                              | 36.7%                                                                             | 16.7%                                                                               | 63.3%                                                                               | 0.0%                                                                                | 0.0%                                                                                | 46.7%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         |                                                                                   |                                                                                   |                                                                                   | 3.2                                                                               |                                                                                   | 3.2                                                                               | 3.0                                                                                 | 3.9                                                                                 |                                                                                     |                                                                                     | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        |                                                                                   |                                                                                   |                                                                                   | 2.0                                                                               |                                                                                   | 2.0                                                                               | 1.0                                                                                 | 1.5                                                                                 |                                                                                     |                                                                                     | 1.5                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 5.2                                                                               | 4.0                                                                               | 5.2                                                                               | 4.0                                                                                 | 5.4                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 5.4                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lead                                                                                |                                                                                     |                                                                                     |                                                                                     | Lag                                                                                 |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                                 |                                                                                     |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |
| Recall Mode             |                                                                                   |                                                                                   |                                                                                   | None                                                                              |                                                                                   | None                                                                              | None                                                                                | C-Min                                                                               |                                                                                     |                                                                                     | C-Min                                                                               |                                                                                     |
| Act Effect Green (s)    |                                                                                   |                                                                                   |                                                                                   | 10.5                                                                              |                                                                                   | 10.5                                                                              | 72.5                                                                                | 72.2                                                                                |                                                                                     |                                                                                     | 36.9                                                                                |                                                                                     |
| Actuated g/C Ratio      |                                                                                   |                                                                                   |                                                                                   | 0.12                                                                              |                                                                                   | 0.12                                                                              | 0.81                                                                                | 0.80                                                                                |                                                                                     |                                                                                     | 0.41                                                                                |                                                                                     |
| v/c Ratio               |                                                                                   |                                                                                   |                                                                                   | 0.58                                                                              |                                                                                   | 0.19                                                                              | 0.66                                                                                | 0.40                                                                                |                                                                                     |                                                                                     | 0.51                                                                                |                                                                                     |
| Control Delay           |                                                                                   |                                                                                   |                                                                                   | 48.6                                                                              |                                                                                   | 12.7                                                                              | 20.1                                                                                | 5.3                                                                                 |                                                                                     |                                                                                     | 21.1                                                                                |                                                                                     |
| Queue Delay             |                                                                                   |                                                                                   |                                                                                   | 0.0                                                                               |                                                                                   | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |                                                                                     | 0.0                                                                                 |                                                                                     |
| Total Delay             |                                                                                   |                                                                                   |                                                                                   | 48.6                                                                              |                                                                                   | 12.7                                                                              | 20.1                                                                                | 5.3                                                                                 |                                                                                     |                                                                                     | 21.1                                                                                |                                                                                     |
| LOS                     |                                                                                   |                                                                                   |                                                                                   | D                                                                                 |                                                                                   | B                                                                                 | C                                                                                   | A                                                                                   |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 10.1                                                                                |                                                                                     |                                                                                     | 21.1                                                                                |                                                                                     |
| Approach LOS            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     | B                                                                                   |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |
| Queue Length 50th (ft)  |                                                                                   |                                                                                   |                                                                                   | 64                                                                                |                                                                                   | 0                                                                                 | 187                                                                                 | 113                                                                                 |                                                                                     |                                                                                     | 158                                                                                 |                                                                                     |
| Queue Length 95th (ft)  |                                                                                   |                                                                                   |                                                                                   | 105                                                                               |                                                                                   | 5                                                                                 | 211                                                                                 | 201                                                                                 |                                                                                     |                                                                                     | 217                                                                                 |                                                                                     |

# Bismarck Exit 161 Operational Study

## 3: North Ramp & Centennial Rd

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 190                                                                               |                                                                                   |                                                                                   | 385                                                                               |                                                                                   |                                                                                    | 679                                                                                 |                                                                                     |                                                                                     | 715                                                                                 |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 150                                                                               | 215                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Base Capacity (vph)     |                                                                                   |                                                                                   |                                                                                   | 527                                                                               |                                                                                   | 529                                                                               | 810                                                                                | 2866                                                                                |                                                                                     |                                                                                     | 1417                                                                                |                                                                                     |
| Starvation Cap Reductn  |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     |                                                                                     | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     |                                                                                     | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     |                                                                                     | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       |                                                                                   |                                                                                   |                                                                                   | 0.22                                                                              |                                                                                   | 0.08                                                                              | 0.66                                                                               | 0.40                                                                                |                                                                                     |                                                                                     | 0.51                                                                                |                                                                                     |

### Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 2 (2%), Referenced to phase 2:SBT and 6:NBTL, Start of Green

Natural Cycle: 65

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.66

Intersection Signal Delay: 15.0

Intersection LOS: B

Intersection Capacity Utilization 61.4%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 3: North Ramp & Centennial Rd



|                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                                   |  |  |  |  |  |  |   |  |  |  |  |  |
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |                                                                                   |  |  |                                                                                   |  |  |  |  |  |                                                                                     |  |  |
| Volume (veh/h)                    | 12                                                                                | 2                                                                                 | 73                                                                                | 101                                                                               | 0                                                                                 | 64                                                                                | 115                                                                                 | 1193                                                                                | 216                                                                                 | 39                                                                                  | 608                                                                                 | 17                                                                                  |
| Sign Control                      |                                                                                   | Stop                                                                              |                                                                                   |                                                                                   | Stop                                                                              |                                                                                   |                                                                                     | Free                                                                                |                                                                                     |                                                                                     | Free                                                                                |                                                                                     |
| Grade                             |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Peak Hour Factor                  | 0.70                                                                              | 0.50                                                                              | 0.70                                                                              | 0.74                                                                              | 0.25                                                                              | 0.64                                                                              | 0.74                                                                                | 0.65                                                                                | 0.84                                                                                | 0.65                                                                                | 0.76                                                                                | 0.43                                                                                |
| Hourly flow rate (vph)            | 17                                                                                | 4                                                                                 | 104                                                                               | 136                                                                               | 0                                                                                 | 100                                                                               | 155                                                                                 | 1835                                                                                | 257                                                                                 | 60                                                                                  | 800                                                                                 | 40                                                                                  |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Width (ft)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Walking Speed (ft/s)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Right turn flare (veh)            |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Median type                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     | None                                                                                |                                                                                     |                                                                                     | None                                                                                |                                                                                     |
| Median storage veh                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Upstream signal (ft)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 795                                                                                 |                                                                                     |                                                                                     | 1292                                                                                |                                                                                     |
| pX, platoon unblocked             | 0.92                                                                              | 0.92                                                                              | 0.98                                                                              | 0.92                                                                              | 0.92                                                                              | 0.91                                                                              | 0.98                                                                                |                                                                                     |                                                                                     | 0.91                                                                                |                                                                                     |                                                                                     |
| vC, conflicting volume            | 2199                                                                              | 3323                                                                              | 800                                                                               | 3197                                                                              | 3234                                                                              | 1046                                                                              | 840                                                                                 |                                                                                     |                                                                                     | 2093                                                                                |                                                                                     |                                                                                     |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vCu, unblocked vol                | 2076                                                                              | 3294                                                                              | 788                                                                               | 3157                                                                              | 3198                                                                              | 863                                                                               | 828                                                                                 |                                                                                     |                                                                                     | 2007                                                                                |                                                                                     |                                                                                     |
| tC, single (s)                    | 7.5                                                                               | 6.5                                                                               | 6.9                                                                               | 7.5                                                                               | 6.5                                                                               | 6.9                                                                               | 4.1                                                                                 |                                                                                     |                                                                                     | 4.1                                                                                 |                                                                                     |                                                                                     |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| tF (s)                            | 3.5                                                                               | 4.0                                                                               | 3.3                                                                               | 3.5                                                                               | 4.0                                                                               | 3.3                                                                               | 2.2                                                                                 |                                                                                     |                                                                                     | 2.2                                                                                 |                                                                                     |                                                                                     |
| p0 queue free %                   | 0                                                                                 | 21                                                                                | 69                                                                                | 0                                                                                 | 100                                                                               | 63                                                                                | 81                                                                                  |                                                                                     |                                                                                     | 77                                                                                  |                                                                                     |                                                                                     |
| cM capacity (veh/h)               | 13                                                                                | 5                                                                                 | 333                                                                               | 1                                                                                 | 6                                                                                 | 272                                                                               | 798                                                                                 |                                                                                     |                                                                                     | 264                                                                                 |                                                                                     |                                                                                     |
| Direction, Lane #                 | EB 1                                                                              | WB 1                                                                              | NB 1                                                                              | NB 2                                                                              | NB 3                                                                              | SB 1                                                                              | SB 2                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Total                      | 125                                                                               | 236                                                                               | 155                                                                               | 1224                                                                              | 869                                                                               | 860                                                                               | 40                                                                                  |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Left                       | 17                                                                                | 136                                                                               | 155                                                                               | 0                                                                                 | 0                                                                                 | 60                                                                                | 0                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Right                      | 104                                                                               | 100                                                                               | 0                                                                                 | 0                                                                                 | 257                                                                               | 0                                                                                 | 40                                                                                  |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| cSH                               | 69                                                                                | 1                                                                                 | 798                                                                               | 1700                                                                              | 1700                                                                              | 264                                                                               | 1700                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume to Capacity                | 1.83                                                                              | 179.86                                                                            | 0.19                                                                              | 0.72                                                                              | 0.51                                                                              | 0.23                                                                              | 0.02                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Queue Length 95th (ft)            | 282                                                                               | Err                                                                               | 18                                                                                | 0                                                                                 | 0                                                                                 | 21                                                                                | 0                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Control Delay (s)                 | 193.0                                                                             | Err                                                                               | 10.6                                                                              | 0.0                                                                               | 0.0                                                                               | 10.6                                                                              | 0.0                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane LOS                          | F                                                                                 | F                                                                                 | B                                                                                 |                                                                                   |                                                                                   | B                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach Delay (s)                | 193.0                                                                             | Err                                                                               | 0.7                                                                               |                                                                                   |                                                                                   | 10.1                                                                              |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach LOS                      | F                                                                                 | F                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Average Delay                     |                                                                                   |                                                                                   | 683.8                                                                             |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 96.3%                                                                             |                                                                                   | ICU Level of Service                                                              |                                                                                   |                                                                                     |                                                                                     |                                                                                     | F                                                                                   |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

|                         |  |  |  |  |  |  |   |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |                                                                                   |  |  |                                                                                   |  |  |                                                                                     |  |  |                                                                                     |
| Volume (vph)            | 54                                                                                | 166                                                                               | 140                                                                               | 117                                                                               | 94                                                                                | 23                                                                                | 152                                                                                 | 482                                                                                 | 207                                                                                 | 35                                                                                  | 241                                                                                 | 30                                                                                  |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 100                                                                               |                                                                                   | 0                                                                                 | 500                                                                               |                                                                                   | 0                                                                                 | 150                                                                                 |                                                                                     | 0                                                                                   | 80                                                                                  |                                                                                     | 0                                                                                   |
| Storage Lanes           | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                   |                                                                                     | 0                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                  |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 35                                                                                |                                                                                   |                                                                                   | 35                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 1306                                                                              |                                                                                   |                                                                                   | 1256                                                                              |                                                                                   |                                                                                     | 268                                                                                 |                                                                                     |                                                                                     | 441                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 25.4                                                                              |                                                                                   |                                                                                   | 24.5                                                                              |                                                                                   |                                                                                     | 4.6                                                                                 |                                                                                     |                                                                                     | 7.5                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.84                                                                              | 0.68                                                                              | 0.90                                                                              | 0.79                                                                              | 0.84                                                                              | 0.58                                                                              | 0.76                                                                                | 0.92                                                                                | 0.78                                                                                | 0.80                                                                                | 0.96                                                                                | 0.83                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                | 1%                                                                                | 3%                                                                                | 2%                                                                                | 0%                                                                                | 4%                                                                                | 2%                                                                                  | 3%                                                                                  | 1%                                                                                  | 3%                                                                                  | 5%                                                                                  | 3%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 64                                                                                | 400                                                                               | 0                                                                                 | 148                                                                               | 152                                                                               | 0                                                                                 | 200                                                                                 | 789                                                                                 | 0                                                                                   | 44                                                                                  | 287                                                                                 | 0                                                                                   |
| Turn Type               | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                                |                                                                                     |                                                                                     | Perm                                                                                |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   |                                                                                     | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   |                                                                                   | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 | 4                                                                                 |                                                                                   | 8                                                                                 | 8                                                                                 |                                                                                   | 6                                                                                   | 6                                                                                   |                                                                                     | 2                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 10.0                                                                              | 10.0                                                                              |                                                                                   | 10.0                                                                              | 10.0                                                                              |                                                                                   | 6.0                                                                                 | 6.0                                                                                 |                                                                                     | 6.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 15.7                                                                              | 15.7                                                                              |                                                                                   | 15.7                                                                              | 15.7                                                                              |                                                                                   | 11.5                                                                                | 11.5                                                                                |                                                                                     | 11.5                                                                                | 11.5                                                                                |                                                                                     |
| Total Split (s)         | 45.0                                                                              | 45.0                                                                              | 0.0                                                                               | 45.0                                                                              | 45.0                                                                              | 0.0                                                                               | 45.0                                                                                | 45.0                                                                                | 0.0                                                                                 | 45.0                                                                                | 45.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 50.0%                                                                             | 50.0%                                                                             | 0.0%                                                                              | 50.0%                                                                             | 50.0%                                                                             | 0.0%                                                                              | 50.0%                                                                               | 50.0%                                                                               | 0.0%                                                                                | 50.0%                                                                               | 50.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.9                                                                               | 3.9                                                                               |                                                                                   | 3.9                                                                               | 3.9                                                                               |                                                                                   | 3.6                                                                                 | 3.6                                                                                 |                                                                                     | 3.6                                                                                 | 3.6                                                                                 |                                                                                     |
| All-Red Time (s)        | 1.8                                                                               | 1.8                                                                               |                                                                                   | 1.8                                                                               | 1.8                                                                               |                                                                                   | 1.9                                                                                 | 1.9                                                                                 |                                                                                     | 1.9                                                                                 | 1.9                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 5.7                                                                               | 5.7                                                                               | 4.0                                                                               | 5.7                                                                               | 5.7                                                                               | 4.0                                                                               | 5.5                                                                                 | 5.5                                                                                 | 4.0                                                                                 | 5.5                                                                                 | 5.5                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Recall Mode             | Max                                                                               | Max                                                                               |                                                                                   | Max                                                                               | Max                                                                               |                                                                                   | C-Max                                                                               | C-Max                                                                               |                                                                                     | C-Max                                                                               | C-Max                                                                               |                                                                                     |
| Act Effct Green (s)     | 39.3                                                                              | 39.3                                                                              |                                                                                   | 39.3                                                                              | 39.3                                                                              |                                                                                   | 39.5                                                                                | 39.5                                                                                |                                                                                     | 39.5                                                                                | 39.5                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.44                                                                              | 0.44                                                                              |                                                                                   | 0.44                                                                              | 0.44                                                                              |                                                                                   | 0.44                                                                                | 0.44                                                                                |                                                                                     | 0.44                                                                                | 0.44                                                                                |                                                                                     |
| v/c Ratio               | 0.12                                                                              | 0.50                                                                              |                                                                                   | 0.44                                                                              | 0.19                                                                              |                                                                                   | 0.47                                                                                | 0.99                                                                                |                                                                                     | 0.54                                                                                | 0.37                                                                                |                                                                                     |
| Control Delay           | 15.9                                                                              | 18.8                                                                              |                                                                                   | 23.1                                                                              | 13.7                                                                              |                                                                                   | 21.4                                                                                | 55.8                                                                                |                                                                                     | 47.5                                                                                | 17.9                                                                                |                                                                                     |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                                 | 0.0                                                                                 |                                                                                     | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |
| Total Delay             | 15.9                                                                              | 18.8                                                                              |                                                                                   | 23.1                                                                              | 13.7                                                                              |                                                                                   | 21.4                                                                                | 55.8                                                                                |                                                                                     | 47.5                                                                                | 17.9                                                                                |                                                                                     |
| LOS                     | B                                                                                 | B                                                                                 |                                                                                   | C                                                                                 | B                                                                                 |                                                                                   | C                                                                                   | E                                                                                   |                                                                                     | D                                                                                   | B                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 18.4                                                                              |                                                                                   |                                                                                   | 18.3                                                                              |                                                                                   |                                                                                     | 48.9                                                                                |                                                                                     |                                                                                     | 21.9                                                                                |                                                                                     |
| Approach LOS            |                                                                                   | B                                                                                 |                                                                                   |                                                                                   | B                                                                                 |                                                                                   |                                                                                     | D                                                                                   |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 21                                                                                | 140                                                                               |                                                                                   | 57                                                                                | 42                                                                                |                                                                                   | 80                                                                                  | 429                                                                                 |                                                                                     | 18                                                                                  | 102                                                                                 |                                                                                     |
| Queue Length 95th (ft)  | 42                                                                                | 147                                                                               |                                                                                   | 94                                                                                | 74                                                                                |                                                                                   | 88                                                                                  | #683                                                                                |                                                                                     | #59                                                                                 | 164                                                                                 |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 1226                                                                              |                                                                                   |                                                                                   | 1176                                                                              |                                                                                   |                                                                                    | 188                                                                                 |                                                                                     |                                                                                     | 361                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 100                                                                               |                                                                                   |                                                                                   | 500                                                                               |                                                                                   |                                                                                   | 150                                                                                |                                                                                     |                                                                                     | 80                                                                                  |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 537                                                                               | 793                                                                               |                                                                                   | 333                                                                               | 803                                                                               |                                                                                   | 428                                                                                | 794                                                                                 |                                                                                     | 82                                                                                  | 786                                                                                 |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.12                                                                              | 0.50                                                                              |                                                                                   | 0.44                                                                              | 0.19                                                                              |                                                                                   | 0.47                                                                               | 0.99                                                                                |                                                                                     | 0.54                                                                                | 0.37                                                                                |                                                                                     |

**Intersection Summary**

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.99

Intersection Signal Delay: 33.4

Intersection LOS: C

Intersection Capacity Utilization 87.3%

ICU Level of Service E

Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 5: Century Ave &amp; Centennial Rd

|                                                                                        |                                                                                        |
|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
|  ø2 |  ø4 |
| 45 s                                                                                   | 45 s                                                                                   |
|  ø6 |  ø8 |
| 45 s                                                                                   | 45 s                                                                                   |

## **Appendix F: 2009 – Existing Conditions Optimized AM (1A1.5)**

Exit 161 Operational Study  
Bismarck, ND

1: Divide Ave & Bismarck Expy

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |                                                                                   |  |  |  |  |  |  |  |  |  |
| Volume (vph)            | 91                                                                                | 98                                                                                | 14                                                                                | 69                                                                                | 47                                                                                | 161                                                                               | 25                                                                                  | 430                                                                                 | 72                                                                                  | 290                                                                                 | 995                                                                                 | 222                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 150                                                                               |                                                                                   | 0                                                                                 | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                 |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                   |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 100                                                                               |                                                                                   | 25                                                                                | 100                                                                               |                                                                                   | 100                                                                               | 100                                                                                 |                                                                                     | 150                                                                                 | 100                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 25                                                                                |                                                                                   |                                                                                   | 25                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 371                                                                               |                                                                                   |                                                                                   | 341                                                                               |                                                                                   |                                                                                     | 614                                                                                 |                                                                                     |                                                                                     | 458                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 10.1                                                                              |                                                                                   |                                                                                   | 9.3                                                                               |                                                                                   |                                                                                     | 10.5                                                                                |                                                                                     |                                                                                     | 7.8                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.78                                                                              | 0.61                                                                              | 0.58                                                                              | 0.86                                                                              | 0.69                                                                              | 0.81                                                                              | 0.63                                                                                | 0.90                                                                                | 0.75                                                                                | 0.68                                                                                | 0.71                                                                                | 0.69                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 13%                                                                               | 5%                                                                                | 0%                                                                                | 6%                                                                                | 17%                                                                               | 26%                                                                               | 4%                                                                                  | 9%                                                                                  | 18%                                                                                 | 2%                                                                                  | 1%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 117                                                                               | 185                                                                               | 0                                                                                 | 80                                                                                | 68                                                                                | 199                                                                               | 40                                                                                  | 478                                                                                 | 96                                                                                  | 426                                                                                 | 1723                                                                                | 0                                                                                   |
| Turn Type               | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                              |                                                                                   | pm+ov                                                                             | Perm                                                                                |                                                                                     | Perm                                                                                | pm+pt                                                                               |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 | 5                                                                                 |                                                                                     | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                   |                                                                                     | 6                                                                                   | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 | 4                                                                                 |                                                                                   | 8                                                                                 | 8                                                                                 | 5                                                                                 | 6                                                                                   | 6                                                                                   | 6                                                                                   | 5                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               | 6.0                                                                               |                                                                                   | 6.0                                                                               | 6.0                                                                               | 5.0                                                                               | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 5.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 30.0                                                                              | 30.0                                                                              |                                                                                   | 12.0                                                                              | 12.0                                                                              | 9.8                                                                               | 22.9                                                                                | 22.9                                                                                | 22.9                                                                                | 9.8                                                                                 | 28.7                                                                                |                                                                                     |
| Total Split (s)         | 30.0                                                                              | 30.0                                                                              | 0.0                                                                               | 30.0                                                                              | 30.0                                                                              | 19.0                                                                              | 41.0                                                                                | 41.0                                                                                | 41.0                                                                                | 19.0                                                                                | 60.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 33.3%                                                                             | 33.3%                                                                             | 0.0%                                                                              | 33.3%                                                                             | 33.3%                                                                             | 21.1%                                                                             | 45.6%                                                                               | 45.6%                                                                               | 45.6%                                                                               | 21.1%                                                                               | 66.7%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 3.0                                                                               | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 | 3.0                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 1.0                                                                               | 1.8                                                                                 | 1.8                                                                                 | 1.8                                                                                 | 1.0                                                                                 | 1.8                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 5.7                                                                                 | 5.7                                                                                 | 5.7                                                                                 | 4.0                                                                                 | 5.7                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lead                                                                              | Lag                                                                                 | Lag                                                                                 | Lag                                                                                 | Lead                                                                                |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                               | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 |                                                                                     |                                                                                     |
| Recall Mode             | None                                                                              | None                                                                              |                                                                                   | None                                                                              | None                                                                              | None                                                                              | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               | None                                                                                | C-Min                                                                               |                                                                                     |
| Act Effect Green (s)    | 14.6                                                                              | 14.6                                                                              |                                                                                   | 14.6                                                                              | 14.6                                                                              | 34.1                                                                              | 46.2                                                                                | 46.2                                                                                | 46.2                                                                                | 65.4                                                                                | 63.7                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.16                                                                              | 0.16                                                                              |                                                                                   | 0.16                                                                              | 0.16                                                                              | 0.38                                                                              | 0.51                                                                                | 0.51                                                                                | 0.51                                                                                | 0.73                                                                                | 0.71                                                                                |                                                                                     |
| v/c Ratio               | 0.60                                                                              | 0.62                                                                              |                                                                                   | 0.52                                                                              | 0.26                                                                              | 0.33                                                                              | 0.33                                                                                | 0.28                                                                                | 0.13                                                                                | 0.59                                                                                | 0.70                                                                                |                                                                                     |
| Control Delay           | 47.0                                                                              | 42.1                                                                              |                                                                                   | 45.6                                                                              | 33.5                                                                              | 3.6                                                                               | 27.4                                                                                | 14.7                                                                                | 4.2                                                                                 | 7.4                                                                                 | 6.1                                                                                 |                                                                                     |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.1                                                                                 |                                                                                     |
| Total Delay             | 47.0                                                                              | 42.1                                                                              |                                                                                   | 45.6                                                                              | 33.5                                                                              | 3.6                                                                               | 27.4                                                                                | 14.7                                                                                | 4.2                                                                                 | 7.4                                                                                 | 6.2                                                                                 |                                                                                     |
| LOS                     | D                                                                                 | D                                                                                 |                                                                                   | D                                                                                 | C                                                                                 | A                                                                                 | C                                                                                   | B                                                                                   | A                                                                                   | A                                                                                   | A                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 44.0                                                                              |                                                                                   |                                                                                   | 19.1                                                                              |                                                                                   |                                                                                     | 13.9                                                                                |                                                                                     |                                                                                     | 6.4                                                                                 |                                                                                     |
| Approach LOS            |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | B                                                                                 |                                                                                   |                                                                                     | B                                                                                   |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 63                                                                                | 95                                                                                |                                                                                   | 42                                                                                | 34                                                                                | 0                                                                                 | 12                                                                                  | 75                                                                                  | 0                                                                                   | 51                                                                                  | 167                                                                                 |                                                                                     |
| Queue Length 95th (ft)  | 92                                                                                | 93                                                                                |                                                                                   | 77                                                                                | 49                                                                                | 23                                                                                | 32                                                                                  | 140                                                                                 | 19                                                                                  | 62                                                                                  | 145                                                                                 |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 291                                                                               |                                                                                   |                                                                                   | 261                                                                               |                                                                                   |                                                                                     | 534                                                                                 |                                                                                     |                                                                                     | 378                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 150                                                                               |                                                                                   |                                                                                   | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                 |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 320                                                                               | 482                                                                               |                                                                                   | 251                                                                               | 433                                                                               | 638                                                                               | 120                                                                                 | 1702                                                                                | 750                                                                                 | 750                                                                                 | 2471                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 91                                                                                  |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.37                                                                              | 0.38                                                                              |                                                                                   | 0.32                                                                              | 0.16                                                                              | 0.31                                                                              | 0.33                                                                                | 0.28                                                                                | 0.13                                                                                | 0.57                                                                                | 0.72                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 6 (7%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.70

Intersection Signal Delay: 12.4

Intersection LOS: B

Intersection Capacity Utilization 65.8%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 1: Divide Ave & Bismarck Expy



Exit 161 Operational Study  
Bismarck, ND

2: South Ramp & Bismarck Expy

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |                                                                                   |  |                                                                                   |                                                                                   |                                                                                   |                                                                                    |  |  |  |  |  |
| Volume (vph)            | 96                                                                                | 0                                                                                 | 389                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 564                                                                                 | 82                                                                                  | 23                                                                                  | 906                                                                                 | 0                                                                                   |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                 | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 0                                                                                 |                                                                                   | 175                                                                               | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  |                                                                                     | 0                                                                                   | 222                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 1                                                                                 |                                                                                   | 1                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 300                                                                               | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                 |                                                                                     | 25                                                                                  | 150                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                    |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                    | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 575                                                                               |                                                                                   |                                                                                   | 383                                                                               |                                                                                   |                                                                                    | 458                                                                                 |                                                                                     |                                                                                     | 769                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 13.1                                                                              |                                                                                   |                                                                                   | 8.7                                                                               |                                                                                   |                                                                                    | 7.8                                                                                 |                                                                                     |                                                                                     | 13.1                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.83                                                                              | 0.92                                                                              | 0.71                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.87                                                                               | 0.87                                                                                | 0.82                                                                                | 0.52                                                                                | 0.78                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                               | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 4%                                                                                | 0%                                                                                | 3%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 0%                                                                                 | 13%                                                                                 | 29%                                                                                 | 13%                                                                                 | 2%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 116                                                                               | 0                                                                                 | 548                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 648                                                                                 | 100                                                                                 | 44                                                                                  | 1162                                                                                | 0                                                                                   |
| Turn Type               | custom                                                                            |                                                                                   | custom                                                                            |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     | Perm                                                                                | Perm                                                                                |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     | 6                                                                                   | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                   | 6                                                                                   | 2                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               |                                                                                   | 6.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 21.1                                                                              |                                                                                   | 21.1                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 23.4                                                                                | 23.4                                                                                | 21.4                                                                                | 21.4                                                                                |                                                                                     |
| Total Split (s)         | 46.0                                                                              | 0.0                                                                               | 46.0                                                                              | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 44.0                                                                                | 44.0                                                                                | 44.0                                                                                | 44.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 51.1%                                                                             | 0.0%                                                                              | 51.1%                                                                             | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                               | 48.9%                                                                               | 48.9%                                                                               | 48.9%                                                                               | 48.9%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.6                                                                               |                                                                                   | 3.6                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 1.5                                                                               |                                                                                   | 1.5                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 1.5                                                                                 | 1.5                                                                                 | 1.5                                                                                 | 1.5                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 5.1                                                                               | 4.0                                                                               | 5.1                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                                | 5.4                                                                                 | 5.4                                                                                 | 5.4                                                                                 | 5.4                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Recall Mode             | None                                                                              |                                                                                   | None                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               |                                                                                     |
| Act Effct Green (s)     | 35.1                                                                              |                                                                                   | 35.1                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 44.4                                                                                | 44.4                                                                                | 44.4                                                                                | 44.4                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.39                                                                              |                                                                                   | 0.39                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.49                                                                                | 0.49                                                                                | 0.49                                                                                | 0.49                                                                                |                                                                                     |
| v/c Ratio               | 0.17                                                                              |                                                                                   | 0.87                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.41                                                                                | 0.15                                                                                | 0.15                                                                                | 0.67                                                                                |                                                                                     |
| Control Delay           | 17.0                                                                              |                                                                                   | 39.0                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 12.4                                                                                | 2.5                                                                                 | 3.9                                                                                 | 5.9                                                                                 |                                                                                     |
| Queue Delay             | 0.0                                                                               |                                                                                   | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |
| Total Delay             | 17.0                                                                              |                                                                                   | 39.0                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 12.4                                                                                | 2.5                                                                                 | 3.9                                                                                 | 5.9                                                                                 |                                                                                     |
| LOS                     | B                                                                                 |                                                                                   | D                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | B                                                                                   | A                                                                                   | A                                                                                   | A                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 11.1                                                                                |                                                                                     |                                                                                     | 5.8                                                                                 |                                                                                     |
| Approach LOS            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | B                                                                                   |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 41                                                                                |                                                                                   | 262                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 77                                                                                  | 1                                                                                   | 5                                                                                   | 125                                                                                 |                                                                                     |
| Queue Length 95th (ft)  | 64                                                                                |                                                                                   | 248                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 107                                                                                 | 10                                                                                  | m5                                                                                  | m131                                                                                |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 495                                                                               |                                                                                   |                                                                                   | 303                                                                               |                                                                                   |                                                                                    | 378                                                                                 |                                                                                     |                                                                                     | 689                                                                                 |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   | 175                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | 222                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 789                                                                               |                                                                                   | 728                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 1576                                                                                | 668                                                                                 | 297                                                                                 | 1745                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.15                                                                              |                                                                                   | 0.75                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.41                                                                                | 0.15                                                                                | 0.15                                                                                | 0.67                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 88 (98%), Referenced to phase 2:SBTL and 6:NBT, Start of Green

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.87

Intersection Signal Delay: 14.7

Intersection LOS: B

Intersection Capacity Utilization 82.9%

ICU Level of Service E

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: South Ramp & Bismarck Expy

|                                                                                        |                                                                                       |
|----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|  ø2  |  ø4 |
| 44 s                                                                                   | 46 s                                                                                  |
|  ø6 |                                                                                       |
| 44 s                                                                                   |                                                                                       |

Exit 161 Operational Study  
Bismarck, ND

3: North Ramp & Bismarck Expy

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |                                                                                   |                                                                                   |                                                                                   |  |                                                                                   |  |  |  |                                                                                     |                                                                                     |  |  |
| Volume (vph)            | 0                                                                                 | 0                                                                                 | 0                                                                                 | 91                                                                                | 0                                                                                 | 9                                                                                 | 331                                                                                 | 425                                                                                 | 0                                                                                   | 0                                                                                   | 1361                                                                                | 304                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 16                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 150                                                                               | 215                                                                                 |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   |
| Storage Lanes           | 0                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 100                                                                               | 150                                                                                 |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 270                                                                               |                                                                                   |                                                                                   | 465                                                                               |                                                                                   |                                                                                     | 769                                                                                 |                                                                                     |                                                                                     | 779                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 6.1                                                                               |                                                                                   |                                                                                   | 10.6                                                                              |                                                                                   |                                                                                     | 13.1                                                                                |                                                                                     |                                                                                     | 13.3                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.73                                                                              | 0.92                                                                              | 0.56                                                                              | 0.94                                                                                | 0.76                                                                                | 0.92                                                                                | 0.92                                                                                | 0.77                                                                                | 0.68                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                | 2%                                                                                | 2%                                                                                | 10%                                                                               | 2%                                                                                | 33%                                                                               | 7%                                                                                  | 4%                                                                                  | 2%                                                                                  | 2%                                                                                  | 1%                                                                                  | 1%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 125                                                                               | 0                                                                                 | 16                                                                                | 352                                                                                 | 559                                                                                 | 0                                                                                   | 0                                                                                   | 2215                                                                                | 0                                                                                   |
| Turn Type               |                                                                                   |                                                                                   |                                                                                   | custom                                                                            |                                                                                   | custom                                                                            | pm+pt                                                                               |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        |                                                                                   |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Detector Phase          |                                                                                   |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 8                                                                                 | 1                                                                                   | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     |                                                                                   |                                                                                   |                                                                                   | 5.0                                                                               |                                                                                   | 5.0                                                                               | 5.0                                                                                 | 10.0                                                                                |                                                                                     |                                                                                     | 10.0                                                                                |                                                                                     |
| Minimum Split (s)       |                                                                                   |                                                                                   |                                                                                   | 20.0                                                                              |                                                                                   | 20.0                                                                              | 9.0                                                                                 | 20.0                                                                                |                                                                                     |                                                                                     | 22.4                                                                                |                                                                                     |
| Total Split (s)         | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 20.0                                                                              | 0.0                                                                               | 20.0                                                                              | 15.0                                                                                | 70.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 55.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                              | 22.2%                                                                             | 0.0%                                                                              | 22.2%                                                                             | 16.7%                                                                               | 77.8%                                                                               | 0.0%                                                                                | 0.0%                                                                                | 61.1%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         |                                                                                   |                                                                                   |                                                                                   | 3.2                                                                               |                                                                                   | 3.2                                                                               | 3.0                                                                                 | 3.9                                                                                 |                                                                                     |                                                                                     | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        |                                                                                   |                                                                                   |                                                                                   | 2.0                                                                               |                                                                                   | 2.0                                                                               | 1.0                                                                                 | 1.5                                                                                 |                                                                                     |                                                                                     | 1.5                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 5.2                                                                               | 4.0                                                                               | 5.2                                                                               | 4.0                                                                                 | 5.4                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 5.4                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lag                                                                                 |                                                                                     |                                                                                     |                                                                                     | Lead                                                                                |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                                 |                                                                                     |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |
| Recall Mode             |                                                                                   |                                                                                   |                                                                                   | None                                                                              |                                                                                   | None                                                                              | None                                                                                | C-Min                                                                               |                                                                                     |                                                                                     | C-Min                                                                               |                                                                                     |
| Act Effect Green (s)    |                                                                                   |                                                                                   |                                                                                   | 10.4                                                                              |                                                                                   | 10.4                                                                              | 70.4                                                                                | 69.0                                                                                |                                                                                     |                                                                                     | 54.0                                                                                |                                                                                     |
| Actuated g/C Ratio      |                                                                                   |                                                                                   |                                                                                   | 0.12                                                                              |                                                                                   | 0.12                                                                              | 0.78                                                                                | 0.77                                                                                |                                                                                     |                                                                                     | 0.60                                                                                |                                                                                     |
| v/c Ratio               |                                                                                   |                                                                                   |                                                                                   | 0.58                                                                              |                                                                                   | 0.10                                                                              | 1.24                                                                                | 0.21                                                                                |                                                                                     |                                                                                     | 1.05                                                                                |                                                                                     |
| Control Delay           |                                                                                   |                                                                                   |                                                                                   | 48.1                                                                              |                                                                                   | 16.8                                                                              | 156.1                                                                               | 2.6                                                                                 |                                                                                     |                                                                                     | 44.4                                                                                |                                                                                     |
| Queue Delay             |                                                                                   |                                                                                   |                                                                                   | 0.0                                                                               |                                                                                   | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |                                                                                     | 0.0                                                                                 |                                                                                     |
| Total Delay             |                                                                                   |                                                                                   |                                                                                   | 48.1                                                                              |                                                                                   | 16.8                                                                              | 156.1                                                                               | 2.6                                                                                 |                                                                                     |                                                                                     | 44.4                                                                                |                                                                                     |
| LOS                     |                                                                                   |                                                                                   |                                                                                   | D                                                                                 |                                                                                   | B                                                                                 | F                                                                                   | A                                                                                   |                                                                                     |                                                                                     | D                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 61.9                                                                                |                                                                                     |                                                                                     | 44.4                                                                                |                                                                                     |
| Approach LOS            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     | E                                                                                   |                                                                                     |                                                                                     | D                                                                                   |                                                                                     |
| Queue Length 50th (ft)  |                                                                                   |                                                                                   |                                                                                   | 69                                                                                |                                                                                   | 0                                                                                 | ~206                                                                                | 19                                                                                  |                                                                                     |                                                                                     | ~723                                                                                |                                                                                     |
| Queue Length 95th (ft)  |                                                                                   |                                                                                   |                                                                                   | 94                                                                                |                                                                                   | 8                                                                                 | #303                                                                                | 43                                                                                  |                                                                                     |                                                                                     | m371                                                                                |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 190                                                                               |                                                                                   |                                                                                   | 385                                                                               |                                                                                   |                                                                                    | 689                                                                                 |                                                                                     |                                                                                     | 699                                                                                 |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 150                                                                               | 215                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Base Capacity (vph)     |                                                                                   |                                                                                   |                                                                                   | 306                                                                               |                                                                                   | 213                                                                               | 285                                                                                | 2662                                                                                |                                                                                     |                                                                                     | 2103                                                                                |                                                                                     |
| Starvation Cap Reductn  |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     |                                                                                     | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     |                                                                                     | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     |                                                                                     | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       |                                                                                   |                                                                                   |                                                                                   | 0.41                                                                              |                                                                                   | 0.08                                                                              | 1.24                                                                               | 0.21                                                                                |                                                                                     |                                                                                     | 1.05                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 64 (71%), Referenced to phase 2:SBT and 6:NBTL, Start of Green

Natural Cycle: 140

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.24

Intersection Signal Delay: 49.3

Intersection LOS: D

Intersection Capacity Utilization 82.9%

ICU Level of Service E

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: North Ramp & Bismarck Expy



|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |                                                                                   |  |  |                                                                                   |  |  |  |  |  |                                                                                     |  |  |
| Volume (veh/h)                    | 6                                                                                 | 1                                                                                 | 181                                                                               | 76                                                                                | 4                                                                                 | 34                                                                                | 63                                                                                  | 352                                                                                 | 83                                                                                  | 17                                                                                  | 1334                                                                                | 22                                                                                  |
| Sign Control                      |                                                                                   | Stop                                                                              |                                                                                   |                                                                                   | Stop                                                                              |                                                                                   |                                                                                     | Free                                                                                |                                                                                     |                                                                                     | Free                                                                                |                                                                                     |
| Grade                             |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Peak Hour Factor                  | 0.38                                                                              | 0.25                                                                              | 0.71                                                                              | 0.63                                                                              | 0.50                                                                              | 0.77                                                                              | 0.79                                                                                | 0.73                                                                                | 0.55                                                                                | 0.71                                                                                | 0.78                                                                                | 0.79                                                                                |
| Hourly flow rate (vph)            | 16                                                                                | 4                                                                                 | 255                                                                               | 121                                                                               | 8                                                                                 | 44                                                                                | 80                                                                                  | 482                                                                                 | 151                                                                                 | 24                                                                                  | 1710                                                                                | 28                                                                                  |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Width (ft)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Walking Speed (ft/s)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Right turn flare (veh)            |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Median type                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     | None                                                                                |                                                                                     |                                                                                     | None                                                                                |                                                                                     |
| Median storage veh                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Upstream signal (ft)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 779                                                                                 |                                                                                     |                                                                                     | 1314                                                                                |                                                                                     |
| pX, platoon unblocked             | 0.23                                                                              | 0.23                                                                              | 0.21                                                                              | 0.23                                                                              | 0.23                                                                              | 0.97                                                                              | 0.21                                                                                |                                                                                     |                                                                                     | 0.97                                                                                |                                                                                     |                                                                                     |
| vC, conflicting volume            | 2426                                                                              | 2551                                                                              | 1710                                                                              | 2402                                                                              | 2428                                                                              | 482                                                                               | 1738                                                                                |                                                                                     |                                                                                     | 633                                                                                 |                                                                                     |                                                                                     |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vCu, unblocked vol                | 5222                                                                              | 5768                                                                              | 2491                                                                              | 5117                                                                              | 5230                                                                              | 447                                                                               | 2623                                                                                |                                                                                     |                                                                                     | 603                                                                                 |                                                                                     |                                                                                     |
| tC, single (s)                    | 7.3                                                                               | 6.5                                                                               | 6.2                                                                               | 7.1                                                                               | 6.5                                                                               | 6.2                                                                               | 4.2                                                                                 |                                                                                     |                                                                                     | 4.2                                                                                 |                                                                                     |                                                                                     |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| tF (s)                            | 3.7                                                                               | 4.0                                                                               | 3.3                                                                               | 3.5                                                                               | 4.0                                                                               | 3.3                                                                               | 2.3                                                                                 |                                                                                     |                                                                                     | 2.3                                                                                 |                                                                                     |                                                                                     |
| p0 queue free %                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 93                                                                                | 0                                                                                   |                                                                                     |                                                                                     | 97                                                                                  |                                                                                     |                                                                                     |
| cM capacity (veh/h)               | 0                                                                                 | 0                                                                                 | 8                                                                                 | 0                                                                                 | 0                                                                                 | 595                                                                               | 32                                                                                  |                                                                                     |                                                                                     | 896                                                                                 |                                                                                     |                                                                                     |
| Direction, Lane #                 | EB 1                                                                              | WB 1                                                                              | NB 1                                                                              | NB 2                                                                              | NB 3                                                                              | SB 1                                                                              | SB 2                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Total                      | 275                                                                               | 173                                                                               | 80                                                                                | 482                                                                               | 151                                                                               | 1734                                                                              | 28                                                                                  |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Left                       | 16                                                                                | 121                                                                               | 80                                                                                | 0                                                                                 | 0                                                                                 | 24                                                                                | 0                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Right                      | 255                                                                               | 44                                                                                | 0                                                                                 | 0                                                                                 | 151                                                                               | 0                                                                                 | 28                                                                                  |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| cSH                               | 0                                                                                 | 0                                                                                 | 32                                                                                | 1700                                                                              | 1700                                                                              | 896                                                                               | 1700                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume to Capacity                | Err                                                                               | Err                                                                               | 2.48                                                                              | 0.28                                                                              | 0.09                                                                              | 0.03                                                                              | 0.02                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Queue Length 95th (ft)            | Err                                                                               | Err                                                                               | 230                                                                               | 0                                                                                 | 0                                                                                 | 2                                                                                 | 0                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Control Delay (s)                 | Err                                                                               | Err                                                                               | 936.2                                                                             | 0.0                                                                               | 0.0                                                                               | 0.1                                                                               | 0.0                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane LOS                          | F                                                                                 | F                                                                                 | F                                                                                 |                                                                                   |                                                                                   | A                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach Delay (s)                | Err                                                                               | Err                                                                               | 104.7                                                                             |                                                                                   |                                                                                   | 0.1                                                                               |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach LOS                      | F                                                                                 | F                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Average Delay                     |                                                                                   |                                                                                   | Err                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 101.5%                                                                            |                                                                                   | ICU Level of Service                                                              |                                                                                   |                                                                                     |                                                                                     | G                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |                                                                                   |  |  |                                                                                   |  |  |                                                                                     |  |  |                                                                                     |
| Volume (vph)            | 17                                                                                | 23                                                                                | 150                                                                               | 570                                                                               | 236                                                                               | 31                                                                                | 110                                                                                 | 241                                                                                 | 43                                                                                  | 20                                                                                  | 867                                                                                 | 78                                                                                  |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 100                                                                               |                                                                                   | 0                                                                                 | 500                                                                               |                                                                                   | 0                                                                                 | 150                                                                                 |                                                                                     | 0                                                                                   | 80                                                                                  |                                                                                     | 0                                                                                   |
| Storage Lanes           | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                   |                                                                                     | 0                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                  |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 35                                                                                |                                                                                   |                                                                                   | 35                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 602                                                                               |                                                                                   |                                                                                   | 733                                                                               |                                                                                   |                                                                                     | 274                                                                                 |                                                                                     |                                                                                     | 497                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 11.7                                                                              |                                                                                   |                                                                                   | 14.3                                                                              |                                                                                   |                                                                                     | 4.7                                                                                 |                                                                                     |                                                                                     | 8.5                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.47                                                                              | 0.72                                                                              | 0.66                                                                              | 0.80                                                                              | 0.62                                                                              | 0.48                                                                              | 0.76                                                                                | 0.71                                                                                | 0.60                                                                                | 0.71                                                                                | 0.81                                                                                | 0.78                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 0%                                                                                | 0%                                                                                | 0%                                                                                | 0%                                                                                | 1%                                                                                | 3%                                                                                | 5%                                                                                  | 5%                                                                                  | 0%                                                                                  | 0%                                                                                  | 2%                                                                                  | 3%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 36                                                                                | 259                                                                               | 0                                                                                 | 712                                                                               | 446                                                                               | 0                                                                                 | 145                                                                                 | 411                                                                                 | 0                                                                                   | 28                                                                                  | 1170                                                                                | 0                                                                                   |
| Turn Type               | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                                |                                                                                     |                                                                                     | Perm                                                                                |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   |                                                                                     | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   |                                                                                   | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 | 4                                                                                 |                                                                                   | 8                                                                                 | 8                                                                                 |                                                                                   | 6                                                                                   | 6                                                                                   |                                                                                     | 2                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 10.0                                                                              | 10.0                                                                              |                                                                                   | 10.0                                                                              | 10.0                                                                              |                                                                                   | 6.0                                                                                 | 6.0                                                                                 |                                                                                     | 6.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 15.7                                                                              | 15.7                                                                              |                                                                                   | 15.7                                                                              | 15.7                                                                              |                                                                                   | 11.5                                                                                | 11.5                                                                                |                                                                                     | 11.5                                                                                | 11.5                                                                                |                                                                                     |
| Total Split (s)         | 41.0                                                                              | 41.0                                                                              | 0.0                                                                               | 41.0                                                                              | 41.0                                                                              | 0.0                                                                               | 49.0                                                                                | 49.0                                                                                | 0.0                                                                                 | 49.0                                                                                | 49.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 45.6%                                                                             | 45.6%                                                                             | 0.0%                                                                              | 45.6%                                                                             | 45.6%                                                                             | 0.0%                                                                              | 54.4%                                                                               | 54.4%                                                                               | 0.0%                                                                                | 54.4%                                                                               | 54.4%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.9                                                                               | 3.9                                                                               |                                                                                   | 3.9                                                                               | 3.9                                                                               |                                                                                   | 3.6                                                                                 | 3.6                                                                                 |                                                                                     | 3.6                                                                                 | 3.6                                                                                 |                                                                                     |
| All-Red Time (s)        | 1.8                                                                               | 1.8                                                                               |                                                                                   | 1.8                                                                               | 1.8                                                                               |                                                                                   | 1.9                                                                                 | 1.9                                                                                 |                                                                                     | 1.9                                                                                 | 1.9                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 5.7                                                                               | 5.7                                                                               | 4.0                                                                               | 5.7                                                                               | 5.7                                                                               | 4.0                                                                               | 5.5                                                                                 | 5.5                                                                                 | 4.0                                                                                 | 5.5                                                                                 | 5.5                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Recall Mode             | Max                                                                               | Max                                                                               |                                                                                   | Max                                                                               | Max                                                                               |                                                                                   | C-Max                                                                               | C-Max                                                                               |                                                                                     | C-Max                                                                               | C-Max                                                                               |                                                                                     |
| Act Effect Green (s)    | 35.3                                                                              | 35.3                                                                              |                                                                                   | 35.3                                                                              | 35.3                                                                              |                                                                                   | 43.5                                                                                | 43.5                                                                                |                                                                                     | 43.5                                                                                | 43.5                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.39                                                                              | 0.39                                                                              |                                                                                   | 0.39                                                                              | 0.39                                                                              |                                                                                   | 0.48                                                                                | 0.48                                                                                |                                                                                     | 0.48                                                                                | 0.48                                                                                |                                                                                     |
| v/c Ratio               | 0.15                                                                              | 0.38                                                                              |                                                                                   | 1.77                                                                              | 0.61                                                                              |                                                                                   | 1.81                                                                                | 0.47                                                                                |                                                                                     | 0.07                                                                                | 1.31                                                                                |                                                                                     |
| Control Delay           | 19.7                                                                              | 17.0                                                                              |                                                                                   | 380.5                                                                             | 25.8                                                                              |                                                                                   | 430.6                                                                               | 10.9                                                                                |                                                                                     | 13.2                                                                                | 172.6                                                                               |                                                                                     |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                                 | 0.0                                                                                 |                                                                                     | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |
| Total Delay             | 19.7                                                                              | 17.0                                                                              |                                                                                   | 380.5                                                                             | 25.8                                                                              |                                                                                   | 430.6                                                                               | 10.9                                                                                |                                                                                     | 13.2                                                                                | 172.6                                                                               |                                                                                     |
| LOS                     | B                                                                                 | B                                                                                 |                                                                                   | F                                                                                 | C                                                                                 |                                                                                   | F                                                                                   | B                                                                                   |                                                                                     | B                                                                                   | F                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 17.3                                                                              |                                                                                   |                                                                                   | 243.9                                                                             |                                                                                   |                                                                                     | 120.4                                                                               |                                                                                     |                                                                                     | 168.8                                                                               |                                                                                     |
| Approach LOS            |                                                                                   | B                                                                                 |                                                                                   |                                                                                   | F                                                                                 |                                                                                   |                                                                                     | F                                                                                   |                                                                                     |                                                                                     | F                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 13                                                                                | 79                                                                                |                                                                                   | ~610                                                                              | 194                                                                               |                                                                                   | ~128                                                                                | 87                                                                                  |                                                                                     | 8                                                                                   | ~871                                                                                |                                                                                     |
| Queue Length 95th (ft)  | 17                                                                                | 101                                                                               |                                                                                   | #706                                                                              | 175                                                                               |                                                                                   | #195                                                                                | 102                                                                                 |                                                                                     | 18                                                                                  | #952                                                                                |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 522                                                                               |                                                                                   |                                                                                   | 653                                                                               |                                                                                   |                                                                                    | 194                                                                                 |                                                                                     |                                                                                     | 417                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 100                                                                               |                                                                                   |                                                                                   | 500                                                                               |                                                                                   |                                                                                   | 150                                                                                |                                                                                     |                                                                                     | 80                                                                                  |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 245                                                                               | 682                                                                               |                                                                                   | 402                                                                               | 726                                                                               |                                                                                   | 80                                                                                 | 867                                                                                 |                                                                                     | 388                                                                                 | 892                                                                                 |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.15                                                                              | 0.38                                                                              |                                                                                   | 1.77                                                                              | 0.61                                                                              |                                                                                   | 1.81                                                                               | 0.47                                                                                |                                                                                     | 0.07                                                                                | 1.31                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 35 (39%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.81

Intersection Signal Delay: 173.6

Intersection LOS: F

Intersection Capacity Utilization 117.2%

ICU Level of Service H

Analysis Period (min) 15

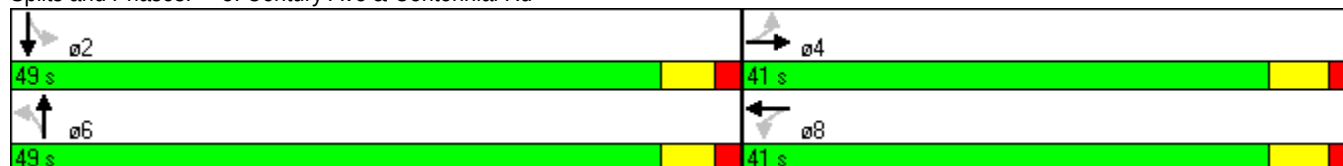
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 5: Century Ave & Centennial Rd



## **Appendix G: 2009 – Existing Conditions Optimized PM (1A2.5)**

Exit 161 Operational Study  
Bismarck, ND

1: Divide Ave & Bismarck Expy

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |                                                                                   |  |  |  |  |  |  |  |  |  |
| Volume (vph)            | 231                                                                               | 45                                                                                | 20                                                                                | 55                                                                                | 45                                                                                | 201                                                                               | 24                                                                                  | 854                                                                                 | 60                                                                                  | 183                                                                                 | 779                                                                                 | 118                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 150                                                                               |                                                                                   | 0                                                                                 | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                 |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                   |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 100                                                                               |                                                                                   | 25                                                                                | 100                                                                               |                                                                                   | 100                                                                               | 100                                                                                 |                                                                                     | 150                                                                                 | 100                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 25                                                                                |                                                                                   |                                                                                   | 25                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 371                                                                               |                                                                                   |                                                                                   | 341                                                                               |                                                                                   |                                                                                     | 614                                                                                 |                                                                                     |                                                                                     | 468                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 10.1                                                                              |                                                                                   |                                                                                   | 9.3                                                                               |                                                                                   |                                                                                     | 10.5                                                                                |                                                                                     |                                                                                     | 8.0                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.85                                                                              | 0.80                                                                              | 0.63                                                                              | 0.63                                                                              | 0.56                                                                              | 0.75                                                                              | 0.75                                                                                | 0.80                                                                                | 0.83                                                                                | 0.88                                                                                | 0.87                                                                                | 0.87                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 1%                                                                                | 2%                                                                                | 0%                                                                                | 18%                                                                               | 7%                                                                                | 14%                                                                               | 8%                                                                                  | 2%                                                                                  | 10%                                                                                 | 10%                                                                                 | 4%                                                                                  | 4%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 272                                                                               | 88                                                                                | 0                                                                                 | 87                                                                                | 80                                                                                | 268                                                                               | 32                                                                                  | 1068                                                                                | 72                                                                                  | 208                                                                                 | 1031                                                                                | 0                                                                                   |
| Turn Type               | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                              |                                                                                   | pm+ov                                                                             | Perm                                                                                |                                                                                     | Perm                                                                                | pm+pt                                                                               |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 | 5                                                                                 |                                                                                     | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                   |                                                                                     | 6                                                                                   | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 | 4                                                                                 |                                                                                   | 8                                                                                 | 8                                                                                 | 5                                                                                 | 6                                                                                   | 6                                                                                   | 6                                                                                   | 5                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               | 6.0                                                                               |                                                                                   | 6.0                                                                               | 6.0                                                                               | 5.0                                                                               | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 5.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 30.0                                                                              | 30.0                                                                              |                                                                                   | 30.0                                                                              | 30.0                                                                              | 9.8                                                                               | 22.9                                                                                | 22.9                                                                                | 22.9                                                                                | 9.8                                                                                 | 28.7                                                                                |                                                                                     |
| Total Split (s)         | 31.0                                                                              | 31.0                                                                              | 0.0                                                                               | 31.0                                                                              | 31.0                                                                              | 17.0                                                                              | 42.0                                                                                | 42.0                                                                                | 42.0                                                                                | 17.0                                                                                | 59.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 34.4%                                                                             | 34.4%                                                                             | 0.0%                                                                              | 34.4%                                                                             | 34.4%                                                                             | 18.9%                                                                             | 46.7%                                                                               | 46.7%                                                                               | 46.7%                                                                               | 18.9%                                                                               | 65.6%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 3.0                                                                               | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 | 3.0                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 1.0                                                                               | 1.8                                                                                 | 1.8                                                                                 | 1.8                                                                                 | 1.0                                                                                 | 1.8                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 5.7                                                                                 | 5.7                                                                                 | 5.7                                                                                 | 4.0                                                                                 | 5.7                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lead                                                                              | Lag                                                                                 | Lag                                                                                 | Lag                                                                                 | Lead                                                                                |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                               | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 |                                                                                     |                                                                                     |
| Recall Mode             | None                                                                              | None                                                                              |                                                                                   | None                                                                              | None                                                                              | None                                                                              | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               | None                                                                                | C-Min                                                                               |                                                                                     |
| Act Effect Green (s)    | 22.0                                                                              | 22.0                                                                              |                                                                                   | 22.0                                                                              | 22.0                                                                              | 38.4                                                                              | 41.9                                                                                | 41.9                                                                                | 41.9                                                                                | 58.0                                                                                | 56.3                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.24                                                                              | 0.24                                                                              |                                                                                   | 0.24                                                                              | 0.24                                                                              | 0.43                                                                              | 0.47                                                                                | 0.47                                                                                | 0.47                                                                                | 0.64                                                                                | 0.63                                                                                |                                                                                     |
| v/c Ratio               | 0.84                                                                              | 0.19                                                                              |                                                                                   | 0.32                                                                              | 0.18                                                                              | 0.43                                                                              | 0.14                                                                                | 0.65                                                                                | 0.10                                                                                | 0.64                                                                                | 0.48                                                                                |                                                                                     |
| Control Delay           | 55.1                                                                              | 18.2                                                                              |                                                                                   | 30.1                                                                              | 26.7                                                                              | 17.2                                                                              | 18.7                                                                                | 22.0                                                                                | 4.8                                                                                 | 22.1                                                                                | 5.6                                                                                 |                                                                                     |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.2                                                                                 |                                                                                     |
| Total Delay             | 55.1                                                                              | 18.2                                                                              |                                                                                   | 30.1                                                                              | 26.7                                                                              | 17.2                                                                              | 18.7                                                                                | 22.0                                                                                | 4.8                                                                                 | 22.1                                                                                | 5.8                                                                                 |                                                                                     |
| LOS                     | E                                                                                 | B                                                                                 |                                                                                   | C                                                                                 | C                                                                                 | B                                                                                 | B                                                                                   | C                                                                                   | A                                                                                   | C                                                                                   | A                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 46.1                                                                              |                                                                                   |                                                                                   | 21.5                                                                              |                                                                                   |                                                                                     | 20.9                                                                                |                                                                                     |                                                                                     | 8.5                                                                                 |                                                                                     |
| Approach LOS            |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | C                                                                                 |                                                                                   |                                                                                     | C                                                                                   |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 143                                                                               | 24                                                                                |                                                                                   | 39                                                                                | 35                                                                                | 87                                                                                | 11                                                                                  | 247                                                                                 | 0                                                                                   | 28                                                                                  | 82                                                                                  |                                                                                     |
| Queue Length 95th (ft)  | #223                                                                              | 51                                                                                |                                                                                   | 53                                                                                | 42                                                                                | 107                                                                               | 26                                                                                  | 287                                                                                 | 21                                                                                  | 113                                                                                 | 115                                                                                 |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 291                                                                               |                                                                                   |                                                                                   | 261                                                                               |                                                                                   |                                                                                    | 534                                                                                 |                                                                                     |                                                                                     | 388                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 150                                                                               |                                                                                   |                                                                                   | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 368                                                                               | 516                                                                               |                                                                                   | 313                                                                               | 493                                                                               | 661                                                                               | 228                                                                                | 1647                                                                                | 722                                                                                 | 367                                                                                 | 2142                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 349                                                                                 |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.74                                                                              | 0.17                                                                              |                                                                                   | 0.28                                                                              | 0.16                                                                              | 0.41                                                                              | 0.14                                                                               | 0.65                                                                                | 0.10                                                                                | 0.57                                                                                | 0.58                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 26 (29%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.84

Intersection Signal Delay: 19.0

Intersection LOS: B

Intersection Capacity Utilization 66.3%

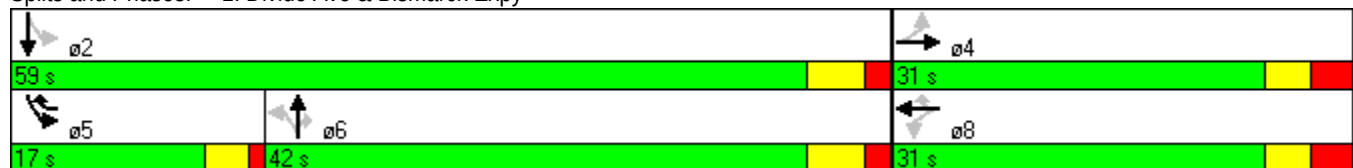
ICU Level of Service C

Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 1: Divide Ave & Bismarck Expy



|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |                                                                                   |  |                                                                                   |                                                                                   |                                                                                   |                                                                                    |  |  |  |  |  |
| Volume (vph)            | 213                                                                               | 0                                                                                 | 286                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 1134                                                                                | 111                                                                                 | 27                                                                                  | 557                                                                                 | 0                                                                                   |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 16                                                                                | 12                                                                                | 12                                                                                | 12                                                                                 | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 0                                                                                 |                                                                                   | 175                                                                               | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  |                                                                                     | 0                                                                                   | 222                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 1                                                                                 |                                                                                   | 1                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 300                                                                               | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                 |                                                                                     | 25                                                                                  | 150                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                    |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                    | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 575                                                                               |                                                                                   |                                                                                   | 383                                                                               |                                                                                   |                                                                                    | 468                                                                                 |                                                                                     |                                                                                     | 759                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 13.1                                                                              |                                                                                   |                                                                                   | 8.7                                                                               |                                                                                   |                                                                                    | 8.0                                                                                 |                                                                                     |                                                                                     | 12.9                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.73                                                                              | 0.92                                                                              | 0.78                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                               | 0.83                                                                                | 0.79                                                                                | 0.61                                                                                | 0.97                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                               | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 3%                                                                                | 2%                                                                                | 12%                                                                               | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                 | 2%                                                                                  | 16%                                                                                 | 7%                                                                                  | 10%                                                                                 | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 292                                                                               | 0                                                                                 | 367                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 1366                                                                                | 141                                                                                 | 44                                                                                  | 574                                                                                 | 0                                                                                   |
| Turn Type               | custom                                                                            |                                                                                   | custom                                                                            |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     | Perm                                                                                | Perm                                                                                |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     | 6                                                                                   | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                   | 6                                                                                   | 2                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               |                                                                                   | 6.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 21.1                                                                              |                                                                                   | 21.1                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 23.4                                                                                | 23.4                                                                                | 21.4                                                                                | 21.4                                                                                |                                                                                     |
| Total Split (s)         | 33.0                                                                              | 0.0                                                                               | 33.0                                                                              | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 57.0                                                                                | 57.0                                                                                | 57.0                                                                                | 57.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 36.7%                                                                             | 0.0%                                                                              | 36.7%                                                                             | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                               | 63.3%                                                                               | 63.3%                                                                               | 63.3%                                                                               | 63.3%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.6                                                                               |                                                                                   | 3.6                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 1.5                                                                               |                                                                                   | 1.5                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 1.5                                                                                 | 1.5                                                                                 | 1.5                                                                                 | 1.5                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 5.1                                                                               | 4.0                                                                               | 5.1                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                                | 5.4                                                                                 | 5.4                                                                                 | 5.4                                                                                 | 5.4                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Recall Mode             | None                                                                              |                                                                                   | None                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               |                                                                                     |
| Act Effct Green (s)     | 20.5                                                                              |                                                                                   | 20.5                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 59.0                                                                                | 59.0                                                                                | 59.0                                                                                | 59.0                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.23                                                                              |                                                                                   | 0.23                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.66                                                                                | 0.66                                                                                | 0.66                                                                                | 0.66                                                                                |                                                                                     |
| v/c Ratio               | 0.73                                                                              |                                                                                   | 0.66                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.59                                                                                | 0.15                                                                                | 0.26                                                                                | 0.27                                                                                |                                                                                     |
| Control Delay           | 42.6                                                                              |                                                                                   | 12.5                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 7.8                                                                                 | 1.9                                                                                 | 6.1                                                                                 | 3.9                                                                                 |                                                                                     |
| Queue Delay             | 0.0                                                                               |                                                                                   | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.1                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |
| Total Delay             | 42.6                                                                              |                                                                                   | 12.5                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 7.9                                                                                 | 1.9                                                                                 | 6.1                                                                                 | 3.9                                                                                 |                                                                                     |
| LOS                     | D                                                                                 |                                                                                   | B                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | A                                                                                   | A                                                                                   | A                                                                                   | A                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 7.3                                                                                 |                                                                                     |                                                                                     | 4.1                                                                                 |                                                                                     |
| Approach LOS            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | A                                                                                   |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 155                                                                               |                                                                                   | 33                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 147                                                                                 | 3                                                                                   | 5                                                                                   | 35                                                                                  |                                                                                     |
| Queue Length 95th (ft)  | 167                                                                               |                                                                                   | 63                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 163                                                                                 | m13                                                                                 | 1                                                                                   | 4                                                                                   |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 495                                                                               |                                                                                   |                                                                                   | 303                                                                               |                                                                                   |                                                                                    | 388                                                                                 |                                                                                     |                                                                                     | 679                                                                                 |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   | 175                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | 222                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 543                                                                               |                                                                                   | 652                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 2320                                                                                | 961                                                                                 | 171                                                                                 | 2152                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 155                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.54                                                                              |                                                                                   | 0.56                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.63                                                                                | 0.15                                                                                | 0.26                                                                                | 0.27                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 15 (17%), Referenced to phase 2:SBTL and 6:NBT, Start of Green

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.73

Intersection Signal Delay: 11.0

Intersection LOS: B

Intersection Capacity Utilization 61.4%

ICU Level of Service B

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: South Ramp & Bismarck Expy

|                                                                                        |                                                                                        |
|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
|  Ø2  |  Ø4 |
| 57 s                                                                                   | 33 s                                                                                   |
|  Ø6 |                                                                                        |
| 57 s                                                                                   |                                                                                        |

|                         |  |  |  |  |  |  |   |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |                                                                                   |                                                                                   |                                                                                   |  |                                                                                   |  |  |  |                                                                                     |                                                                                     |  |  |
| Volume (vph)            | 0                                                                                 | 0                                                                                 | 0                                                                                 | 99                                                                                | 0                                                                                 | 21                                                                                | 371                                                                                 | 1055                                                                                | 0                                                                                   | 0                                                                                   | 536                                                                                 | 149                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 16                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 150                                                                               | 215                                                                                 |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   |
| Storage Lanes           | 0                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 100                                                                               | 150                                                                                 |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 270                                                                               |                                                                                   |                                                                                   | 465                                                                               |                                                                                   |                                                                                     | 759                                                                                 |                                                                                     |                                                                                     | 795                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 6.1                                                                               |                                                                                   |                                                                                   | 10.6                                                                              |                                                                                   |                                                                                     | 12.9                                                                                |                                                                                     |                                                                                     | 13.6                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.85                                                                              | 0.25                                                                              | 0.48                                                                              | 0.69                                                                                | 0.93                                                                                | 0.92                                                                                | 0.92                                                                                | 0.96                                                                                | 0.93                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                | 2%                                                                                | 2%                                                                                | 20%                                                                               | 0%                                                                                | 0%                                                                                | 3%                                                                                  | 1%                                                                                  | 2%                                                                                  | 2%                                                                                  | 4%                                                                                  | 1%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 116                                                                               | 0                                                                                 | 44                                                                                | 538                                                                                 | 1134                                                                                | 0                                                                                   | 0                                                                                   | 718                                                                                 | 0                                                                                   |
| Turn Type               |                                                                                   |                                                                                   |                                                                                   | custom                                                                            |                                                                                   | custom                                                                            | pm+pt                                                                               |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        |                                                                                   |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Detector Phase          |                                                                                   |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 8                                                                                 | 1                                                                                   | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     |                                                                                   |                                                                                   |                                                                                   | 5.0                                                                               |                                                                                   | 5.0                                                                               | 5.0                                                                                 | 10.0                                                                                |                                                                                     |                                                                                     | 10.0                                                                                |                                                                                     |
| Minimum Split (s)       |                                                                                   |                                                                                   |                                                                                   | 20.0                                                                              |                                                                                   | 20.0                                                                              | 9.0                                                                                 | 20.0                                                                                |                                                                                     |                                                                                     | 22.4                                                                                |                                                                                     |
| Total Split (s)         | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 20.0                                                                              | 0.0                                                                               | 20.0                                                                              | 38.0                                                                                | 70.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 32.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                              | 22.2%                                                                             | 0.0%                                                                              | 22.2%                                                                             | 42.2%                                                                               | 77.8%                                                                               | 0.0%                                                                                | 0.0%                                                                                | 35.6%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         |                                                                                   |                                                                                   |                                                                                   | 3.2                                                                               |                                                                                   | 3.2                                                                               | 3.0                                                                                 | 3.9                                                                                 |                                                                                     |                                                                                     | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        |                                                                                   |                                                                                   |                                                                                   | 2.0                                                                               |                                                                                   | 2.0                                                                               | 1.0                                                                                 | 1.5                                                                                 |                                                                                     |                                                                                     | 1.5                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 5.2                                                                               | 4.0                                                                               | 5.2                                                                               | 4.0                                                                                 | 5.4                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 5.4                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lag                                                                                 |                                                                                     |                                                                                     |                                                                                     | Lead                                                                                |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                                 |                                                                                     |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |
| Recall Mode             |                                                                                   |                                                                                   |                                                                                   | None                                                                              |                                                                                   | None                                                                              | None                                                                                | C-Min                                                                               |                                                                                     |                                                                                     | C-Min                                                                               |                                                                                     |
| Act Effect Green (s)    |                                                                                   |                                                                                   |                                                                                   | 10.4                                                                              |                                                                                   | 10.4                                                                              | 72.6                                                                                | 72.3                                                                                |                                                                                     |                                                                                     | 48.9                                                                                |                                                                                     |
| Actuated g/C Ratio      |                                                                                   |                                                                                   |                                                                                   | 0.12                                                                              |                                                                                   | 0.12                                                                              | 0.81                                                                                | 0.80                                                                                |                                                                                     |                                                                                     | 0.54                                                                                |                                                                                     |
| v/c Ratio               |                                                                                   |                                                                                   |                                                                                   | 0.59                                                                              |                                                                                   | 0.19                                                                              | 0.73                                                                                | 0.40                                                                                |                                                                                     |                                                                                     | 0.39                                                                                |                                                                                     |
| Control Delay           |                                                                                   |                                                                                   |                                                                                   | 49.1                                                                              |                                                                                   | 12.8                                                                              | 10.4                                                                                | 2.2                                                                                 |                                                                                     |                                                                                     | 13.6                                                                                |                                                                                     |
| Queue Delay             |                                                                                   |                                                                                   |                                                                                   | 0.0                                                                               |                                                                                   | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |                                                                                     | 0.0                                                                                 |                                                                                     |
| Total Delay             |                                                                                   |                                                                                   |                                                                                   | 49.1                                                                              |                                                                                   | 12.8                                                                              | 10.4                                                                                | 2.2                                                                                 |                                                                                     |                                                                                     | 13.6                                                                                |                                                                                     |
| LOS                     |                                                                                   |                                                                                   |                                                                                   | D                                                                                 |                                                                                   | B                                                                                 | B                                                                                   | A                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 4.8                                                                                 |                                                                                     |                                                                                     | 13.6                                                                                |                                                                                     |
| Approach LOS            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     | A                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| Queue Length 50th (ft)  |                                                                                   |                                                                                   |                                                                                   | 64                                                                                |                                                                                   | 0                                                                                 | 31                                                                                  | 45                                                                                  |                                                                                     |                                                                                     | 103                                                                                 |                                                                                     |
| Queue Length 95th (ft)  |                                                                                   |                                                                                   |                                                                                   | 105                                                                               |                                                                                   | 5                                                                                 | 53                                                                                  | 71                                                                                  |                                                                                     |                                                                                     | 240                                                                                 |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 190                                                                               |                                                                                   |                                                                                   | 385                                                                               |                                                                                   |                                                                                    | 679                                                                                 |                                                                                     |                                                                                     | 715                                                                                 |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 150                                                                               | 215                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Base Capacity (vph)     |                                                                                   |                                                                                   |                                                                                   | 280                                                                               |                                                                                   | 302                                                                               | 996                                                                                | 2870                                                                                |                                                                                     |                                                                                     | 1853                                                                                |                                                                                     |
| Starvation Cap Reductn  |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     |                                                                                     | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     |                                                                                     | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     |                                                                                     | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       |                                                                                   |                                                                                   |                                                                                   | 0.41                                                                              |                                                                                   | 0.15                                                                              | 0.54                                                                               | 0.40                                                                                |                                                                                     |                                                                                     | 0.39                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 16 (18%), Referenced to phase 2:SBT and 6:NBTL, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.73

Intersection Signal Delay: 9.4

Intersection LOS: A

Intersection Capacity Utilization 61.4%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 3: North Ramp & Centennial Rd



|                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                                   |  |  |  |  |  |  |   |  |  |  |  |  |
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |                                                                                   |  |  |                                                                                   |  |  |  |  |                                                                                     |                                                                                     |  |  |
| Volume (veh/h)                    | 14                                                                                | 2                                                                                 | 73                                                                                | 101                                                                               | 0                                                                                 | 64                                                                                | 115                                                                                 | 1193                                                                                | 216                                                                                 | 39                                                                                  | 608                                                                                 | 17                                                                                  |
| Sign Control                      |                                                                                   | Stop                                                                              |                                                                                   |                                                                                   | Stop                                                                              |                                                                                   |                                                                                     | Free                                                                                |                                                                                     |                                                                                     | Free                                                                                |                                                                                     |
| Grade                             |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Peak Hour Factor                  | 0.70                                                                              | 0.50                                                                              | 0.70                                                                              | 0.74                                                                              | 0.25                                                                              | 0.64                                                                              | 0.74                                                                                | 0.65                                                                                | 0.84                                                                                | 0.65                                                                                | 0.76                                                                                | 0.43                                                                                |
| Hourly flow rate (vph)            | 20                                                                                | 4                                                                                 | 104                                                                               | 136                                                                               | 0                                                                                 | 100                                                                               | 155                                                                                 | 1835                                                                                | 257                                                                                 | 60                                                                                  | 800                                                                                 | 40                                                                                  |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Width (ft)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Walking Speed (ft/s)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Right turn flare (veh)            |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Median type                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     | None                                                                                |                                                                                     |                                                                                     | None                                                                                |                                                                                     |
| Median storage (veh)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Upstream signal (ft)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 795                                                                                 |                                                                                     |                                                                                     | 1292                                                                                |                                                                                     |
| pX, platoon unblocked             | 0.91                                                                              | 0.91                                                                              |                                                                                   | 0.91                                                                              | 0.91                                                                              | 0.91                                                                              |                                                                                     |                                                                                     |                                                                                     | 0.91                                                                                |                                                                                     |                                                                                     |
| vC, conflicting volume            | 2199                                                                              | 3323                                                                              | 800                                                                               | 3197                                                                              | 3234                                                                              | 1046                                                                              | 840                                                                                 |                                                                                     |                                                                                     | 2093                                                                                |                                                                                     |                                                                                     |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vCu, unblocked vol                | 2124                                                                              | 3353                                                                              | 800                                                                               | 3215                                                                              | 3256                                                                              | 865                                                                               | 840                                                                                 |                                                                                     |                                                                                     | 2008                                                                                |                                                                                     |                                                                                     |
| tC, single (s)                    | 7.5                                                                               | 6.5                                                                               | 6.9                                                                               | 7.5                                                                               | 6.5                                                                               | 6.9                                                                               | 4.1                                                                                 |                                                                                     |                                                                                     | 4.1                                                                                 |                                                                                     |                                                                                     |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| tF (s)                            | 3.5                                                                               | 4.0                                                                               | 3.3                                                                               | 3.5                                                                               | 4.0                                                                               | 3.3                                                                               | 2.2                                                                                 |                                                                                     |                                                                                     | 2.2                                                                                 |                                                                                     |                                                                                     |
| p0 queue free %                   | 0                                                                                 | 13                                                                                | 69                                                                                | 0                                                                                 | 100                                                                               | 63                                                                                | 81                                                                                  |                                                                                     |                                                                                     | 77                                                                                  |                                                                                     |                                                                                     |
| cM capacity (veh/h)               | 12                                                                                | 5                                                                                 | 332                                                                               | 1                                                                                 | 5                                                                                 | 272                                                                               | 804                                                                                 |                                                                                     |                                                                                     | 264                                                                                 |                                                                                     |                                                                                     |
| Direction, Lane #                 | EB 1                                                                              | WB 1                                                                              | NB 1                                                                              | NB 2                                                                              | NB 3                                                                              | SB 1                                                                              | SB 2                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Total                      | 128                                                                               | 236                                                                               | 155                                                                               | 1224                                                                              | 869                                                                               | 860                                                                               | 40                                                                                  |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Left                       | 20                                                                                | 136                                                                               | 155                                                                               | 0                                                                                 | 0                                                                                 | 60                                                                                | 0                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Right                      | 104                                                                               | 100                                                                               | 0                                                                                 | 0                                                                                 | 257                                                                               | 0                                                                                 | 40                                                                                  |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| cSH                               | 56                                                                                | 1                                                                                 | 804                                                                               | 1700                                                                              | 1700                                                                              | 264                                                                               | 1700                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume to Capacity                | 2.30                                                                              | 266.07                                                                            | 0.19                                                                              | 0.72                                                                              | 0.51                                                                              | 0.23                                                                              | 0.02                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Queue Length 95th (ft)            | 320                                                                               | Err                                                                               | 18                                                                                | 0                                                                                 | 0                                                                                 | 21                                                                                | 0                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Control Delay (s)                 | 752.3                                                                             | Err                                                                               | 10.5                                                                              | 0.0                                                                               | 0.0                                                                               | 10.6                                                                              | 0.0                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane LOS                          | F                                                                                 | F                                                                                 | B                                                                                 |                                                                                   |                                                                                   | B                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach Delay (s)                | 752.3                                                                             | Err                                                                               | 0.7                                                                               |                                                                                   |                                                                                   | 10.1                                                                              |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach LOS                      | F                                                                                 | F                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Average Delay                     |                                                                                   |                                                                                   | 703.8                                                                             |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 96.3%                                                                             | ICU Level of Service                                                              |                                                                                   |                                                                                   |                                                                                     | F                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |                                                                                   |  |  |                                                                                   |  |  |                                                                                     |  |  |                                                                                     |
| Volume (vph)            | 54                                                                                | 166                                                                               | 140                                                                               | 117                                                                               | 94                                                                                | 23                                                                                | 152                                                                                 | 482                                                                                 | 207                                                                                 | 35                                                                                  | 241                                                                                 | 30                                                                                  |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 100                                                                               |                                                                                   | 0                                                                                 | 500                                                                               |                                                                                   | 0                                                                                 | 150                                                                                 |                                                                                     | 0                                                                                   | 80                                                                                  |                                                                                     | 0                                                                                   |
| Storage Lanes           | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                   |                                                                                     | 0                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                  |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 35                                                                                |                                                                                   |                                                                                   | 35                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 624                                                                               |                                                                                   |                                                                                   | 819                                                                               |                                                                                   |                                                                                     | 268                                                                                 |                                                                                     |                                                                                     | 441                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 12.2                                                                              |                                                                                   |                                                                                   | 16.0                                                                              |                                                                                   |                                                                                     | 4.6                                                                                 |                                                                                     |                                                                                     | 7.5                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.84                                                                              | 0.68                                                                              | 0.90                                                                              | 0.79                                                                              | 0.84                                                                              | 0.58                                                                              | 0.76                                                                                | 0.92                                                                                | 0.78                                                                                | 0.80                                                                                | 0.96                                                                                | 0.83                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                | 1%                                                                                | 3%                                                                                | 2%                                                                                | 0%                                                                                | 4%                                                                                | 2%                                                                                  | 3%                                                                                  | 1%                                                                                  | 3%                                                                                  | 5%                                                                                  | 3%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 64                                                                                | 400                                                                               | 0                                                                                 | 148                                                                               | 152                                                                               | 0                                                                                 | 200                                                                                 | 789                                                                                 | 0                                                                                   | 44                                                                                  | 287                                                                                 | 0                                                                                   |
| Turn Type               | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                                |                                                                                     |                                                                                     | Perm                                                                                |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   |                                                                                     | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   |                                                                                   | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 | 4                                                                                 |                                                                                   | 8                                                                                 | 8                                                                                 |                                                                                   | 6                                                                                   | 6                                                                                   |                                                                                     | 2                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 10.0                                                                              | 10.0                                                                              |                                                                                   | 10.0                                                                              | 10.0                                                                              |                                                                                   | 6.0                                                                                 | 6.0                                                                                 |                                                                                     | 6.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 15.7                                                                              | 15.7                                                                              |                                                                                   | 15.7                                                                              | 15.7                                                                              |                                                                                   | 11.5                                                                                | 11.5                                                                                |                                                                                     | 11.5                                                                                | 11.5                                                                                |                                                                                     |
| Total Split (s)         | 36.0                                                                              | 36.0                                                                              | 0.0                                                                               | 36.0                                                                              | 36.0                                                                              | 0.0                                                                               | 54.0                                                                                | 54.0                                                                                | 0.0                                                                                 | 54.0                                                                                | 54.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 40.0%                                                                             | 40.0%                                                                             | 0.0%                                                                              | 40.0%                                                                             | 40.0%                                                                             | 0.0%                                                                              | 60.0%                                                                               | 60.0%                                                                               | 0.0%                                                                                | 60.0%                                                                               | 60.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.9                                                                               | 3.9                                                                               |                                                                                   | 3.9                                                                               | 3.9                                                                               |                                                                                   | 3.6                                                                                 | 3.6                                                                                 |                                                                                     | 3.6                                                                                 | 3.6                                                                                 |                                                                                     |
| All-Red Time (s)        | 1.8                                                                               | 1.8                                                                               |                                                                                   | 1.8                                                                               | 1.8                                                                               |                                                                                   | 1.9                                                                                 | 1.9                                                                                 |                                                                                     | 1.9                                                                                 | 1.9                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 5.7                                                                               | 5.7                                                                               | 4.0                                                                               | 5.7                                                                               | 5.7                                                                               | 4.0                                                                               | 5.5                                                                                 | 5.5                                                                                 | 4.0                                                                                 | 5.5                                                                                 | 5.5                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Recall Mode             | Max                                                                               | Max                                                                               |                                                                                   | Max                                                                               | Max                                                                               |                                                                                   | C-Max                                                                               | C-Max                                                                               |                                                                                     | C-Max                                                                               | C-Max                                                                               |                                                                                     |
| Act Effect Green (s)    | 30.3                                                                              | 30.3                                                                              |                                                                                   | 30.3                                                                              | 30.3                                                                              |                                                                                   | 48.5                                                                                | 48.5                                                                                |                                                                                     | 48.5                                                                                | 48.5                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.34                                                                              | 0.34                                                                              |                                                                                   | 0.34                                                                              | 0.34                                                                              |                                                                                   | 0.54                                                                                | 0.54                                                                                |                                                                                     | 0.54                                                                                | 0.54                                                                                |                                                                                     |
| v/c Ratio               | 0.15                                                                              | 0.65                                                                              |                                                                                   | 0.72                                                                              | 0.24                                                                              |                                                                                   | 0.36                                                                                | 0.81                                                                                |                                                                                     | 0.27                                                                                | 0.30                                                                                |                                                                                     |
| Control Delay           | 22.3                                                                              | 28.5                                                                              |                                                                                   | 48.4                                                                              | 19.6                                                                              |                                                                                   | 14.0                                                                                | 25.5                                                                                |                                                                                     | 16.7                                                                                | 11.9                                                                                |                                                                                     |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                                 | 0.0                                                                                 |                                                                                     | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |
| Total Delay             | 22.3                                                                              | 28.5                                                                              |                                                                                   | 48.4                                                                              | 19.6                                                                              |                                                                                   | 14.0                                                                                | 25.5                                                                                |                                                                                     | 16.7                                                                                | 11.9                                                                                |                                                                                     |
| LOS                     | C                                                                                 | C                                                                                 |                                                                                   | D                                                                                 | B                                                                                 |                                                                                   | B                                                                                   | C                                                                                   |                                                                                     | B                                                                                   | B                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 27.7                                                                              |                                                                                   |                                                                                   | 33.8                                                                              |                                                                                   |                                                                                     | 23.2                                                                                |                                                                                     |                                                                                     | 12.5                                                                                |                                                                                     |
| Approach LOS            |                                                                                   | C                                                                                 |                                                                                   |                                                                                   | C                                                                                 |                                                                                   |                                                                                     | C                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 25                                                                                | 172                                                                               |                                                                                   | 73                                                                                | 52                                                                                |                                                                                   | 56                                                                                  | 369                                                                                 |                                                                                     | 13                                                                                  | 80                                                                                  |                                                                                     |
| Queue Length 95th (ft)  | 51                                                                                | 180                                                                               |                                                                                   | #136                                                                              | 90                                                                                |                                                                                   | 81                                                                                  | #560                                                                                |                                                                                     | 32                                                                                  | 130                                                                                 |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 544                                                                               |                                                                                   |                                                                                   | 739                                                                               |                                                                                   |                                                                                    | 188                                                                                 |                                                                                     |                                                                                     | 361                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 100                                                                               |                                                                                   |                                                                                   | 500                                                                               |                                                                                   |                                                                                   | 150                                                                                |                                                                                     |                                                                                     | 80                                                                                  |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 414                                                                               | 617                                                                               |                                                                                   | 206                                                                               | 623                                                                               |                                                                                   | 557                                                                                | 971                                                                                 |                                                                                     | 163                                                                                 | 964                                                                                 |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.15                                                                              | 0.65                                                                              |                                                                                   | 0.72                                                                              | 0.24                                                                              |                                                                                   | 0.36                                                                               | 0.81                                                                                |                                                                                     | 0.27                                                                                | 0.30                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 77 (86%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.81

Intersection Signal Delay: 24.0

Intersection LOS: C

Intersection Capacity Utilization 87.3%

ICU Level of Service E

Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 5: Century Ave & Centennial Rd

|                                                                                        |                                                                                        |
|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
|  ø2 |  ø4 |
| 54 s                                                                                   | 36 s                                                                                   |
|  ø6 |  ø8 |
| 54 s                                                                                   | 36 s                                                                                   |

## **Appendix H: 2009 - Signal at Trenton AM (1B1)**

Exit 161 Operational Study  
Bismarck, ND

1: Divide Ave & Bismarck Expy

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |                                                                                   |  |  |  |  |  |  |  |  |  |
| Volume (vph)            | 91                                                                                | 98                                                                                | 14                                                                                | 69                                                                                | 47                                                                                | 161                                                                               | 25                                                                                  | 430                                                                                 | 72                                                                                  | 290                                                                                 | 995                                                                                 | 222                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 150                                                                               |                                                                                   | 0                                                                                 | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                 |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                   |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 100                                                                               |                                                                                   | 25                                                                                | 100                                                                               |                                                                                   | 100                                                                               | 100                                                                                 |                                                                                     | 150                                                                                 | 100                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 25                                                                                |                                                                                   |                                                                                   | 25                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 371                                                                               |                                                                                   |                                                                                   | 341                                                                               |                                                                                   |                                                                                     | 614                                                                                 |                                                                                     |                                                                                     | 458                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 10.1                                                                              |                                                                                   |                                                                                   | 9.3                                                                               |                                                                                   |                                                                                     | 10.5                                                                                |                                                                                     |                                                                                     | 7.8                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.78                                                                              | 0.61                                                                              | 0.58                                                                              | 0.86                                                                              | 0.69                                                                              | 0.81                                                                              | 0.63                                                                                | 0.90                                                                                | 0.75                                                                                | 0.68                                                                                | 0.71                                                                                | 0.69                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 13%                                                                               | 5%                                                                                | 0%                                                                                | 6%                                                                                | 17%                                                                               | 26%                                                                               | 4%                                                                                  | 9%                                                                                  | 18%                                                                                 | 2%                                                                                  | 1%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 117                                                                               | 185                                                                               | 0                                                                                 | 80                                                                                | 68                                                                                | 199                                                                               | 40                                                                                  | 478                                                                                 | 96                                                                                  | 426                                                                                 | 1723                                                                                | 0                                                                                   |
| Turn Type               | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                              |                                                                                   | pm+ov                                                                             | Perm                                                                                |                                                                                     | Perm                                                                                | pm+pt                                                                               |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 | 5                                                                                 |                                                                                     | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                   |                                                                                     | 6                                                                                   | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 | 4                                                                                 |                                                                                   | 8                                                                                 | 8                                                                                 | 5                                                                                 | 6                                                                                   | 6                                                                                   | 6                                                                                   | 5                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               | 6.0                                                                               |                                                                                   | 6.0                                                                               | 6.0                                                                               | 5.0                                                                               | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 5.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 30.0                                                                              | 30.0                                                                              |                                                                                   | 30.0                                                                              | 30.0                                                                              | 9.8                                                                               | 22.9                                                                                | 22.9                                                                                | 22.9                                                                                | 9.8                                                                                 | 28.7                                                                                |                                                                                     |
| Total Split (s)         | 30.0                                                                              | 30.0                                                                              | 0.0                                                                               | 30.0                                                                              | 30.0                                                                              | 18.1                                                                              | 41.9                                                                                | 41.9                                                                                | 41.9                                                                                | 18.1                                                                                | 60.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 33.3%                                                                             | 33.3%                                                                             | 0.0%                                                                              | 33.3%                                                                             | 33.3%                                                                             | 20.1%                                                                             | 46.6%                                                                               | 46.6%                                                                               | 46.6%                                                                               | 20.1%                                                                               | 66.7%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 3.0                                                                               | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 | 3.0                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 1.0                                                                               | 1.8                                                                                 | 1.8                                                                                 | 1.8                                                                                 | 1.0                                                                                 | 1.8                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 5.7                                                                                 | 5.7                                                                                 | 5.7                                                                                 | 4.0                                                                                 | 5.7                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lag                                                                               | Lead                                                                                | Lead                                                                                | Lead                                                                                | Lag                                                                                 |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                               | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 |                                                                                     |                                                                                     |
| Recall Mode             | None                                                                              | None                                                                              |                                                                                   | None                                                                              | None                                                                              | None                                                                              | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               | None                                                                                | C-Min                                                                               |                                                                                     |
| Act Effect Green (s)    | 14.6                                                                              | 14.6                                                                              |                                                                                   | 14.6                                                                              | 14.6                                                                              | 42.9                                                                              | 37.4                                                                                | 37.4                                                                                | 37.4                                                                                | 65.4                                                                                | 63.7                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.16                                                                              | 0.16                                                                              |                                                                                   | 0.16                                                                              | 0.16                                                                              | 0.48                                                                              | 0.42                                                                                | 0.42                                                                                | 0.42                                                                                | 0.73                                                                                | 0.71                                                                                |                                                                                     |
| v/c Ratio               | 0.60                                                                              | 0.62                                                                              |                                                                                   | 0.52                                                                              | 0.26                                                                              | 0.28                                                                              | 0.49                                                                                | 0.35                                                                                | 0.15                                                                                | 0.51                                                                                | 0.70                                                                                |                                                                                     |
| Control Delay           | 47.0                                                                              | 42.1                                                                              |                                                                                   | 45.6                                                                              | 33.5                                                                              | 3.4                                                                               | 43.6                                                                                | 18.9                                                                                | 4.0                                                                                 | 7.4                                                                                 | 5.8                                                                                 |                                                                                     |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.1                                                                                 |                                                                                     |
| Total Delay             | 47.0                                                                              | 42.1                                                                              |                                                                                   | 45.6                                                                              | 33.5                                                                              | 3.4                                                                               | 43.6                                                                                | 18.9                                                                                | 4.0                                                                                 | 7.4                                                                                 | 5.9                                                                                 |                                                                                     |
| LOS                     | D                                                                                 | D                                                                                 |                                                                                   | D                                                                                 | C                                                                                 | A                                                                                 | D                                                                                   | B                                                                                   | A                                                                                   | A                                                                                   | A                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 44.0                                                                              |                                                                                   |                                                                                   | 19.0                                                                              |                                                                                   |                                                                                     | 18.1                                                                                |                                                                                     |                                                                                     | 6.2                                                                                 |                                                                                     |
| Approach LOS            |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | B                                                                                 |                                                                                   |                                                                                     | B                                                                                   |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 63                                                                                | 95                                                                                |                                                                                   | 42                                                                                | 34                                                                                | 0                                                                                 | 17                                                                                  | 98                                                                                  | 0                                                                                   | 55                                                                                  | 162                                                                                 |                                                                                     |
| Queue Length 95th (ft)  | 92                                                                                | 93                                                                                |                                                                                   | 77                                                                                | 49                                                                                | 26                                                                                | 32                                                                                  | 129                                                                                 | 17                                                                                  | 63                                                                                  | 135                                                                                 |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 291                                                                               |                                                                                   |                                                                                   | 261                                                                               |                                                                                   |                                                                                     | 534                                                                                 |                                                                                     |                                                                                     | 378                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 150                                                                               |                                                                                   |                                                                                   | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                 |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 320                                                                               | 482                                                                               |                                                                                   | 251                                                                               | 433                                                                               | 715                                                                               | 84                                                                                  | 1434                                                                                | 647                                                                                 | 837                                                                                 | 2471                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 12                                                                                  | 91                                                                                  |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.37                                                                              | 0.38                                                                              |                                                                                   | 0.32                                                                              | 0.16                                                                              | 0.28                                                                              | 0.48                                                                                | 0.33                                                                                | 0.15                                                                                | 0.52                                                                                | 0.72                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 10 (11%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.70

Intersection Signal Delay: 13.0

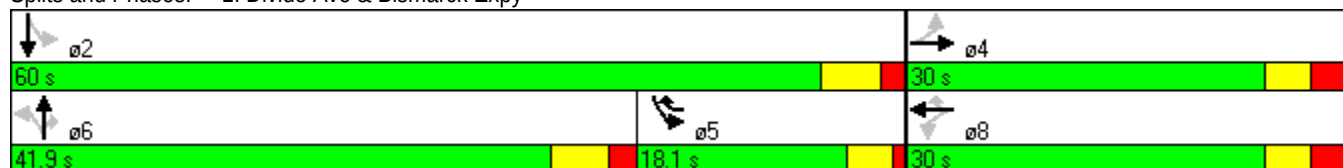
Intersection LOS: B

Intersection Capacity Utilization 65.8%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 1: Divide Ave & Bismarck Expy



|                         |  |  |  |  |  |  |  |                                                                                      |  |  |                                                                                      |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                                                                                                     | NBR                                                                                 | SBL                                                                                 | SBT                                                                                                                                                                     | SBR                                                                                 |
| Lane Configurations     |  |                                                                                   |  |                                                                                   |                                                                                   |                                                                                   |                                                                                     |   |  |  |   |                                                                                     |
| Volume (vph)            | 96                                                                                | 0                                                                                 | 389                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 564                                                                                                                                                                     | 82                                                                                  | 23                                                                                  | 906                                                                                                                                                                     | 0                                                                                   |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                                                                                                    | 1900                                                                                | 1900                                                                                | 1900                                                                                                                                                                    | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                                                                                                      | 12                                                                                  | 12                                                                                  | 12                                                                                                                                                                      | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                                                                                                      |                                                                                     |                                                                                     | 0%                                                                                                                                                                      |                                                                                     |
| Storage Length (ft)     | 0                                                                                 |                                                                                   | 175                                                                               | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                   |                                                                                                                                                                         | 0                                                                                   | 222                                                                                 |                                                                                                                                                                         | 0                                                                                   |
| Storage Lanes           | 1                                                                                 |                                                                                   | 1                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                   |                                                                                                                                                                         | 1                                                                                   | 1                                                                                   |                                                                                                                                                                         | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 300                                                                               | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                  |                                                                                                                                                                         | 25                                                                                  | 150                                                                                 |                                                                                                                                                                         | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                                                                                                         | Yes                                                                                 |                                                                                     |                                                                                                                                                                         | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                     | 40                                                                                                                                                                      |                                                                                     |                                                                                     | 40                                                                                                                                                                      |                                                                                     |
| Link Distance (ft)      |                                                                                   | 575                                                                               |                                                                                   |                                                                                   | 383                                                                               |                                                                                   |                                                                                     | 458                                                                                                                                                                     |                                                                                     |                                                                                     | 769                                                                                                                                                                     |                                                                                     |
| Travel Time (s)         |                                                                                   | 13.1                                                                              |                                                                                   |                                                                                   | 8.7                                                                               |                                                                                   |                                                                                     | 7.8                                                                                                                                                                     |                                                                                     |                                                                                     | 13.1                                                                                                                                                                    |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                                                                                                         |                                                                                     |                                                                                     |                                                                                                                                                                         |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                                                                                                         |                                                                                     |                                                                                     |                                                                                                                                                                         |                                                                                     |
| Peak Hour Factor        | 0.83                                                                              | 0.92                                                                              | 0.71                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.87                                                                                | 0.87                                                                                                                                                                    | 0.82                                                                                | 0.52                                                                                | 0.78                                                                                                                                                                    | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                                                                                                    | 100%                                                                                | 100%                                                                                | 100%                                                                                                                                                                    | 100%                                                                                |
| Heavy Vehicles (%)      | 4%                                                                                | 0%                                                                                | 3%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 0%                                                                                  | 13%                                                                                                                                                                     | 29%                                                                                 | 13%                                                                                 | 2%                                                                                                                                                                      | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                                                                                                       | 0                                                                                   | 0                                                                                   | 0                                                                                                                                                                       | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                                                                                                         |                                                                                     |                                                                                     |                                                                                                                                                                         |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                                                                                                      |                                                                                     |                                                                                     | 0%                                                                                                                                                                      |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                                                                                                         |                                                                                     |                                                                                     |                                                                                                                                                                         |                                                                                     |
| Lane Group Flow (vph)   | 116                                                                               | 0                                                                                 | 548                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 648                                                                                                                                                                     | 100                                                                                 | 44                                                                                  | 1162                                                                                                                                                                    | 0                                                                                   |
| Turn Type               | custom                                                                            |                                                                                   | custom                                                                            |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                                                                                                         | Perm                                                                                | Perm                                                                                |                                                                                                                                                                         |                                                                                     |
| Protected Phases        |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 6                                                                                                                                                                       |                                                                                     |                                                                                     | 2                                                                                                                                                                       |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                                                                                                         | 6                                                                                   | 2                                                                                   |                                                                                                                                                                         |                                                                                     |
| Detector Phase          | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 6                                                                                                                                                                       | 6                                                                                   | 2                                                                                   | 2                                                                                                                                                                       |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                                                                                                         |                                                                                     |                                                                                     |                                                                                                                                                                         |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               |                                                                                   | 6.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 6.0                                                                                                                                                                     | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                                                                                                     |                                                                                     |
| Minimum Split (s)       | 21.1                                                                              |                                                                                   | 21.1                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 23.4                                                                                                                                                                    | 23.4                                                                                | 21.4                                                                                | 21.4                                                                                                                                                                    |                                                                                     |
| Total Split (s)         | 46.0                                                                              | 0.0                                                                               | 46.0                                                                              | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 44.0                                                                                                                                                                    | 44.0                                                                                | 44.0                                                                                | 44.0                                                                                                                                                                    | 0.0                                                                                 |
| Total Split (%)         | 51.1%                                                                             | 0.0%                                                                              | 51.1%                                                                             | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                                | 48.9%                                                                                                                                                                   | 48.9%                                                                               | 48.9%                                                                               | 48.9%                                                                                                                                                                   | 0.0%                                                                                |
| Yellow Time (s)         | 3.6                                                                               |                                                                                   | 3.6                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 3.9                                                                                                                                                                     | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                                                                                                     |                                                                                     |
| All-Red Time (s)        | 1.5                                                                               |                                                                                   | 1.5                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 1.5                                                                                                                                                                     | 1.5                                                                                 | 1.5                                                                                 | 1.5                                                                                                                                                                     |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                                                                                                     | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                                                                                                     | 0.0                                                                                 |
| Total Lost Time (s)     | 5.1                                                                               | 4.0                                                                               | 5.1                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                                 | 5.4                                                                                                                                                                     | 5.4                                                                                 | 5.4                                                                                 | 5.4                                                                                                                                                                     | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                                                                                                         |                                                                                     |                                                                                     |                                                                                                                                                                         |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                                                                                                         |                                                                                     |                                                                                     |                                                                                                                                                                         |                                                                                     |
| Recall Mode             | None                                                                              |                                                                                   | None                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     | C-Min                                                                                                                                                                   | C-Min                                                                               | C-Min                                                                               | C-Min                                                                                                                                                                   |                                                                                     |
| Act Effct Green (s)     | 35.1                                                                              |                                                                                   | 35.1                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 44.4                                                                                                                                                                    | 44.4                                                                                | 44.4                                                                                | 44.4                                                                                                                                                                    |                                                                                     |
| Actuated g/C Ratio      | 0.39                                                                              |                                                                                   | 0.39                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 0.49                                                                                                                                                                    | 0.49                                                                                | 0.49                                                                                | 0.49                                                                                                                                                                    |                                                                                     |
| v/c Ratio               | 0.17                                                                              |                                                                                   | 0.87                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 0.41                                                                                                                                                                    | 0.15                                                                                | 0.15                                                                                | 0.67                                                                                                                                                                    |                                                                                     |
| Control Delay           | 17.0                                                                              |                                                                                   | 39.0                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 13.4                                                                                                                                                                    | 2.4                                                                                 | 5.4                                                                                 | 7.9                                                                                                                                                                     |                                                                                     |
| Queue Delay             | 0.0                                                                               |                                                                                   | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 0.0                                                                                                                                                                     | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                                                                                                     |                                                                                     |
| Total Delay             | 17.0                                                                              |                                                                                   | 39.0                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 13.4                                                                                                                                                                    | 2.4                                                                                 | 5.4                                                                                 | 7.9                                                                                                                                                                     |                                                                                     |
| LOS                     | B                                                                                 |                                                                                   | D                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                     | B                                                                                                                                                                       | A                                                                                   | A                                                                                   | A                                                                                                                                                                       |                                                                                     |
| Approach Delay          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 12.0                                                                                                                                                                    |                                                                                     |                                                                                     | 7.8                                                                                                                                                                     |                                                                                     |
| Approach LOS            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     | B                                                                                                                                                                       |                                                                                     |                                                                                     | A                                                                                                                                                                       |                                                                                     |
| Queue Length 50th (ft)  | 41                                                                                |                                                                                   | 262                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 160                                                                                                                                                                     | 1                                                                                   | 7                                                                                   | 176                                                                                                                                                                     |                                                                                     |
| Queue Length 95th (ft)  | 64                                                                                |                                                                                   | 248                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 206                                                                                                                                                                     | 5                                                                                   | m7                                                                                  | m186                                                                                                                                                                    |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 495                                                                               |                                                                                   |                                                                                   | 303                                                                               |                                                                                   |                                                                                    | 378                                                                                 |                                                                                     |                                                                                     | 689                                                                                 |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   | 175                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | 222                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 789                                                                               |                                                                                   | 728                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 1576                                                                                | 668                                                                                 | 297                                                                                 | 1745                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.15                                                                              |                                                                                   | 0.75                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.41                                                                                | 0.15                                                                                | 0.15                                                                                | 0.67                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 18 (20%), Referenced to phase 2:SBTL and 6:NBT, Start of Green

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.87

Intersection Signal Delay: 15.9

Intersection LOS: B

Intersection Capacity Utilization 82.9%

ICU Level of Service E

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: South Ramp & Centennial Rd

|                                                                                        |                                                                                       |
|----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|  ø2  |  ø4 |
| 44 s                                                                                   | 46 s                                                                                  |
|  ø6 |                                                                                       |
| 44 s                                                                                   |                                                                                       |

|                         |  |      |      |                                                                                   |      |                                                                                     |                                                                                     |                                                                                     |      |      |                                                                                     |                                                                                     |
|-------------------------|------------------------------------------------------------------------------------|------|------|-----------------------------------------------------------------------------------|------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------|------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                                | EBT  | EBR  | WBL                                                                               | WBT  | WBR                                                                                 | NBL                                                                                 | NBT                                                                                 | NBR  | SBL  | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |                                                                                    |      |      |  |      |  |  |  |      |      |  |  |
| Volume (vph)            | 0                                                                                  | 0    | 0    | 91                                                                                | 0    | 9                                                                                   | 331                                                                                 | 425                                                                                 | 0    | 0    | 1361                                                                                | 304                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                               | 1900 | 1900 | 1900                                                                              | 1900 | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900 | 1900 | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                 | 12   | 12   | 16                                                                                | 12   | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12   | 12   | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                    | 0%   |      |                                                                                   | 0%   |                                                                                     |                                                                                     | 0%                                                                                  |      |      | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 0                                                                                  |      | 0    | 0                                                                                 |      | 150                                                                                 | 215                                                                                 |                                                                                     | 0    | 0    |                                                                                     | 0                                                                                   |
| Storage Lanes           | 0                                                                                  |      | 0    | 1                                                                                 |      | 1                                                                                   | 1                                                                                   |                                                                                     | 0    | 0    |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                 |      | 25   | 25                                                                                |      | 100                                                                                 | 150                                                                                 |                                                                                     | 25   | 25   |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                    |      | Yes  |                                                                                   |      | Yes                                                                                 |                                                                                     |                                                                                     | Yes  |      |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                    | 30   |      |                                                                                   | 30   |                                                                                     |                                                                                     | 40                                                                                  |      |      | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                    | 270  |      |                                                                                   | 465  |                                                                                     |                                                                                     | 769                                                                                 |      |      | 791                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                    | 6.1  |      |                                                                                   | 10.6 |                                                                                     |                                                                                     | 13.1                                                                                |      |      | 13.5                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     |                                                                                     |      |      |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     |                                                                                     |      |      |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                               | 0.92 | 0.92 | 0.73                                                                              | 0.92 | 0.56                                                                                | 0.94                                                                                | 0.76                                                                                | 0.92 | 0.92 | 0.77                                                                                | 0.68                                                                                |
| Growth Factor           | 100%                                                                               | 100% | 100% | 100%                                                                              | 100% | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100% | 100% | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                 | 2%   | 2%   | 10%                                                                               | 2%   | 33%                                                                                 | 7%                                                                                  | 4%                                                                                  | 2%   | 2%   | 1%                                                                                  | 1%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                  | 0    | 0    | 0                                                                                 | 0    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0    | 0    | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     |                                                                                     |      |      |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                    | 0%   |      |                                                                                   | 0%   |                                                                                     |                                                                                     | 0%                                                                                  |      |      | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     |                                                                                     |      |      |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 0                                                                                  | 0    | 0    | 125                                                                               | 0    | 16                                                                                  | 352                                                                                 | 559                                                                                 | 0    | 0    | 2215                                                                                | 0                                                                                   |
| Turn Type               |                                                                                    |      |      | custom                                                                            |      | custom                                                                              | pm+pt                                                                               |                                                                                     |      |      |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                    |      |      |                                                                                   |      |                                                                                     | 1                                                                                   | 6                                                                                   |      |      | 2                                                                                   |                                                                                     |
| Permitted Phases        |                                                                                    |      |      | 8                                                                                 |      | 8                                                                                   | 6                                                                                   |                                                                                     |      |      |                                                                                     |                                                                                     |
| Detector Phase          |                                                                                    |      |      | 8                                                                                 |      | 8                                                                                   | 1                                                                                   | 6                                                                                   |      |      | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     |                                                                                     |      |      |                                                                                     |                                                                                     |
| Minimum Initial (s)     |                                                                                    |      |      | 5.0                                                                               |      | 5.0                                                                                 | 5.0                                                                                 | 10.0                                                                                |      |      | 10.0                                                                                |                                                                                     |
| Minimum Split (s)       |                                                                                    |      |      | 20.0                                                                              |      | 20.0                                                                                | 9.0                                                                                 | 20.0                                                                                |      |      | 22.4                                                                                |                                                                                     |
| Total Split (s)         | 0.0                                                                                | 0.0  | 0.0  | 20.0                                                                              | 0.0  | 20.0                                                                                | 15.0                                                                                | 70.0                                                                                | 0.0  | 0.0  | 55.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 0.0%                                                                               | 0.0% | 0.0% | 22.2%                                                                             | 0.0% | 22.2%                                                                               | 16.7%                                                                               | 77.8%                                                                               | 0.0% | 0.0% | 61.1%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         |                                                                                    |      |      | 3.2                                                                               |      | 3.2                                                                                 | 3.0                                                                                 | 3.9                                                                                 |      |      | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        |                                                                                    |      |      | 2.0                                                                               |      | 2.0                                                                                 | 1.0                                                                                 | 1.5                                                                                 |      |      | 1.5                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                                | 0.0  | 0.0  | 0.0                                                                               | 0.0  | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0  | 0.0  | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                                | 4.0  | 4.0  | 5.2                                                                               | 4.0  | 5.2                                                                                 | 4.0                                                                                 | 5.4                                                                                 | 4.0  | 4.0  | 5.4                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                    |      |      |                                                                                   |      |                                                                                     | Lag                                                                                 |                                                                                     |      |      | Lead                                                                                |                                                                                     |
| Lead-Lag Optimize?      |                                                                                    |      |      |                                                                                   |      |                                                                                     | Yes                                                                                 |                                                                                     |      |      | Yes                                                                                 |                                                                                     |
| Recall Mode             |                                                                                    |      |      | None                                                                              |      | None                                                                                | None                                                                                | C-Min                                                                               |      |      | C-Min                                                                               |                                                                                     |
| Act Effect Green (s)    |                                                                                    |      |      | 10.4                                                                              |      | 10.4                                                                                | 70.4                                                                                | 69.0                                                                                |      |      | 54.0                                                                                |                                                                                     |
| Actuated g/C Ratio      |                                                                                    |      |      | 0.12                                                                              |      | 0.12                                                                                | 0.78                                                                                | 0.77                                                                                |      |      | 0.60                                                                                |                                                                                     |
| v/c Ratio               |                                                                                    |      |      | 0.58                                                                              |      | 0.10                                                                                | 1.24                                                                                | 0.21                                                                                |      |      | 1.05                                                                                |                                                                                     |
| Control Delay           |                                                                                    |      |      | 48.1                                                                              |      | 16.8                                                                                | 154.6                                                                               | 1.8                                                                                 |      |      | 37.7                                                                                |                                                                                     |
| Queue Delay             |                                                                                    |      |      | 0.0                                                                               |      | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |      |      | 0.0                                                                                 |                                                                                     |
| Total Delay             |                                                                                    |      |      | 48.1                                                                              |      | 16.8                                                                                | 154.6                                                                               | 1.8                                                                                 |      |      | 37.7                                                                                |                                                                                     |
| LOS                     |                                                                                    |      |      | D                                                                                 |      | B                                                                                   | F                                                                                   | A                                                                                   |      |      | D                                                                                   |                                                                                     |
| Approach Delay          |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     | 60.8                                                                                |      |      | 37.7                                                                                |                                                                                     |
| Approach LOS            |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     | E                                                                                   |      |      | D                                                                                   |                                                                                     |
| Queue Length 50th (ft)  |                                                                                    |      |      | 69                                                                                |      | 0                                                                                   | ~206                                                                                | 12                                                                                  |      |      | ~754                                                                                |                                                                                     |
| Queue Length 95th (ft)  |                                                                                    |      |      | 94                                                                                |      | 8                                                                                   | #401                                                                                | 25                                                                                  |      |      | m205                                                                                |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 190                                                                               |                                                                                   |                                                                                   | 385                                                                               |                                                                                   |                                                                                     | 689                                                                                 |                                                                                     |                                                                                     | 711                                                                                 |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 150                                                                               | 215                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Base Capacity (vph)     |                                                                                   |                                                                                   |                                                                                   | 306                                                                               |                                                                                   | 213                                                                               | 285                                                                                 | 2662                                                                                |                                                                                     |                                                                                     | 2103                                                                                |                                                                                     |
| Starvation Cap Reductn  |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                   | 0                                                                                   |                                                                                     |                                                                                     | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                   | 0                                                                                   |                                                                                     |                                                                                     | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                   | 0                                                                                   |                                                                                     |                                                                                     | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       |                                                                                   |                                                                                   |                                                                                   | 0.41                                                                              |                                                                                   | 0.08                                                                              | 1.24                                                                                | 0.21                                                                                |                                                                                     |                                                                                     | 1.05                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 80 (89%), Referenced to phase 2:SBT and 6:NBTL, Start of Green

Natural Cycle: 140

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.24

Intersection Signal Delay: 44.4

Intersection LOS: D

Intersection Capacity Utilization 82.9%

ICU Level of Service E

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

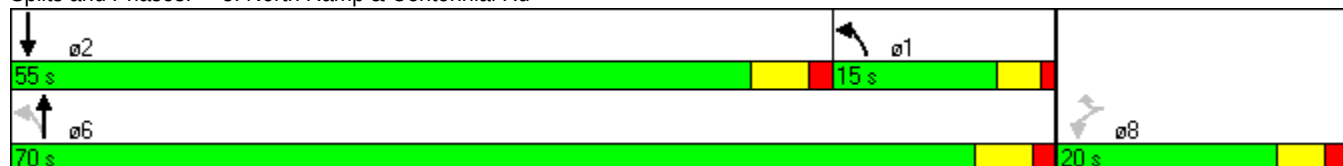
Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: North Ramp & Centennial Rd



|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |                                                                                   |  |                                                                                   |                                                                                   |  |                                                                                   |  |  |                                                                                     |                                                                                     |  |  |
| Volume (vph)            | 6                                                                                 | 1                                                                                 | 181                                                                               | 76                                                                                | 4                                                                                 | 34                                                                                | 63                                                                                  | 352                                                                                 | 83                                                                                  | 17                                                                                  | 1334                                                                                | 22                                                                                  |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 0                                                                                 |                                                                                   | 215                                                                               | 0                                                                                 |                                                                                   | 215                                                                               | 530                                                                                 |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     | 115                                                                                 |
| Storage Lanes           | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     | 1                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                  |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 1774                                                                              |                                                                                   |                                                                                   | 1749                                                                              |                                                                                   |                                                                                     | 791                                                                                 |                                                                                     |                                                                                     | 260                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 40.3                                                                              |                                                                                   |                                                                                   | 39.8                                                                              |                                                                                   |                                                                                     | 13.5                                                                                |                                                                                     |                                                                                     | 4.4                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.38                                                                              | 0.25                                                                              | 0.71                                                                              | 0.63                                                                              | 0.50                                                                              | 0.77                                                                              | 0.79                                                                                | 0.73                                                                                | 0.55                                                                                | 0.71                                                                                | 0.78                                                                                | 0.79                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 17%                                                                               | 0%                                                                                | 1%                                                                                | 1%                                                                                | 0%                                                                                | 0%                                                                                | 10%                                                                                 | 9%                                                                                  | 2%                                                                                  | 12%                                                                                 | 2%                                                                                  | 14%                                                                                 |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 0                                                                                 | 275                                                                               | 0                                                                                 | 0                                                                                 | 173                                                                               | 0                                                                                 | 80                                                                                  | 633                                                                                 | 0                                                                                   | 0                                                                                   | 1734                                                                                | 28                                                                                  |
| Turn Type               | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                              |                                                                                   |                                                                                   | pm+pt                                                                               |                                                                                     |                                                                                     | Perm                                                                                |                                                                                     | Perm                                                                                |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   |                                                                                   | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     | 2                                                                                   |
| Detector Phase          | 4                                                                                 | 4                                                                                 |                                                                                   | 8                                                                                 | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     | 2                                                                                   | 2                                                                                   | 2                                                                                   |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 4.0                                                                               | 4.0                                                                               |                                                                                   | 4.0                                                                               | 4.0                                                                               |                                                                                   | 5.0                                                                                 | 4.0                                                                                 |                                                                                     | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 |
| Minimum Split (s)       | 20.0                                                                              | 20.0                                                                              |                                                                                   | 20.0                                                                              | 20.0                                                                              |                                                                                   | 9.0                                                                                 | 20.0                                                                                |                                                                                     | 20.0                                                                                | 20.0                                                                                | 20.0                                                                                |
| Total Split (s)         | 22.0                                                                              | 22.0                                                                              | 0.0                                                                               | 22.0                                                                              | 22.0                                                                              | 0.0                                                                               | 12.0                                                                                | 68.0                                                                                | 0.0                                                                                 | 56.0                                                                                | 56.0                                                                                | 56.0                                                                                |
| Total Split (%)         | 24.4%                                                                             | 24.4%                                                                             | 0.0%                                                                              | 24.4%                                                                             | 24.4%                                                                             | 0.0%                                                                              | 13.3%                                                                               | 75.6%                                                                               | 0.0%                                                                                | 62.2%                                                                               | 62.2%                                                                               | 62.2%                                                                               |
| Yellow Time (s)         | 3.5                                                                               | 3.5                                                                               |                                                                                   | 3.5                                                                               | 3.5                                                                               |                                                                                   | 3.5                                                                                 | 3.5                                                                                 |                                                                                     | 3.5                                                                                 | 3.5                                                                                 | 3.5                                                                                 |
| All-Red Time (s)        | 0.5                                                                               | 0.5                                                                               |                                                                                   | 0.5                                                                               | 0.5                                                                               |                                                                                   | 0.5                                                                                 | 0.5                                                                                 |                                                                                     | 0.5                                                                                 | 0.5                                                                                 | 0.5                                                                                 |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lag                                                                                 |                                                                                     |                                                                                     | Lead                                                                                | Lead                                                                                | Lead                                                                                |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 |
| Recall Mode             | None                                                                              | None                                                                              |                                                                                   | None                                                                              | None                                                                              |                                                                                   | None                                                                                | C-Min                                                                               |                                                                                     | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               |
| Act Effect Green (s)    |                                                                                   | 21.6                                                                              |                                                                                   |                                                                                   | 21.6                                                                              |                                                                                   | 61.5                                                                                | 60.4                                                                                |                                                                                     |                                                                                     | 52.0                                                                                | 52.0                                                                                |
| Actuated g/C Ratio      |                                                                                   | 0.24                                                                              |                                                                                   |                                                                                   | 0.24                                                                              |                                                                                   | 0.68                                                                                | 0.67                                                                                |                                                                                     |                                                                                     | 0.58                                                                                | 0.58                                                                                |
| v/c Ratio               |                                                                                   | 0.54                                                                              |                                                                                   |                                                                                   | 0.88                                                                              |                                                                                   | 0.42                                                                                | 0.29                                                                                |                                                                                     |                                                                                     | 1.63                                                                                | 0.03                                                                                |
| Control Delay           |                                                                                   | 17.8                                                                              |                                                                                   |                                                                                   | 73.3                                                                              |                                                                                   | 34.1                                                                                | 10.2                                                                                |                                                                                     |                                                                                     | 308.4                                                                               | 7.4                                                                                 |
| Queue Delay             |                                                                                   | 0.0                                                                               |                                                                                   |                                                                                   | 0.0                                                                               |                                                                                   | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |                                                                                     | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             |                                                                                   | 17.8                                                                              |                                                                                   |                                                                                   | 73.3                                                                              |                                                                                   | 34.1                                                                                | 10.2                                                                                |                                                                                     |                                                                                     | 308.4                                                                               | 7.4                                                                                 |
| LOS                     |                                                                                   | B                                                                                 |                                                                                   |                                                                                   | E                                                                                 |                                                                                   | C                                                                                   | B                                                                                   |                                                                                     |                                                                                     | F                                                                                   | A                                                                                   |
| Approach Delay          |                                                                                   | 17.8                                                                              |                                                                                   |                                                                                   | 73.3                                                                              |                                                                                   |                                                                                     | 12.9                                                                                |                                                                                     |                                                                                     | 303.7                                                                               |                                                                                     |
| Approach LOS            |                                                                                   | B                                                                                 |                                                                                   |                                                                                   | E                                                                                 |                                                                                   |                                                                                     | B                                                                                   |                                                                                     |                                                                                     | F                                                                                   |                                                                                     |
| Queue Length 50th (ft)  |                                                                                   | 54                                                                                |                                                                                   |                                                                                   | 88                                                                                |                                                                                   | 28                                                                                  | 120                                                                                 |                                                                                     |                                                                                     | ~1489                                                                               | 5                                                                                   |
| Queue Length 95th (ft)  |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   | 78                                                                                |                                                                                   | 44                                                                                  | 103                                                                                 |                                                                                     |                                                                                     | m#878                                                                               | m4                                                                                  |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 1694                                                                              |                                                                                   |                                                                                   | 1669                                                                              |                                                                                   |                                                                                    | 711                                                                                 |                                                                                     |                                                                                     | 180                                                                                 |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 530                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     | 115                                                                                 |
| Base Capacity (vph)     |                                                                                   | 507                                                                               |                                                                                   |                                                                                   | 197                                                                               |                                                                                   | 222                                                                                | 2339                                                                                |                                                                                     |                                                                                     | 1061                                                                                | 823                                                                                 |
| Starvation Cap Reductn  |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     |                                                                                     | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     |                                                                                     | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     |                                                                                     | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       |                                                                                   | 0.54                                                                              |                                                                                   |                                                                                   | 0.88                                                                              |                                                                                   | 0.36                                                                               | 0.27                                                                                |                                                                                     |                                                                                     | 1.63                                                                                | 0.03                                                                                |

#### Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 60 (67%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 150

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.63

Intersection Signal Delay: 192.2

Intersection LOS: F

Intersection Capacity Utilization 111.9%

ICU Level of Service H

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Trenton Dr & Centennial Rd

|                                                                                        |                                                                                         |                                                                                          |
|----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
|  ø2 |  ø1 |  ø4 |
| 56 s                                                                                   | 12 s                                                                                    | 22 s                                                                                     |
|  ø6 |                                                                                         |  ø8 |
| 68 s                                                                                   |                                                                                         | 22 s                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |                                                                                   |  |  |                                                                                   |  |  |                                                                                     |  |  |                                                                                     |
| Volume (vph)            | 17                                                                                | 23                                                                                | 150                                                                               | 570                                                                               | 236                                                                               | 31                                                                                | 110                                                                                 | 241                                                                                 | 43                                                                                  | 20                                                                                  | 867                                                                                 | 78                                                                                  |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 100                                                                               |                                                                                   | 0                                                                                 | 500                                                                               |                                                                                   | 0                                                                                 | 150                                                                                 |                                                                                     | 0                                                                                   | 80                                                                                  |                                                                                     | 0                                                                                   |
| Storage Lanes           | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                   |                                                                                     | 0                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                  |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 35                                                                                |                                                                                   |                                                                                   | 35                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 1736                                                                              |                                                                                   |                                                                                   | 1872                                                                              |                                                                                   |                                                                                     | 241                                                                                 |                                                                                     |                                                                                     | 511                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 33.8                                                                              |                                                                                   |                                                                                   | 36.5                                                                              |                                                                                   |                                                                                     | 4.1                                                                                 |                                                                                     |                                                                                     | 8.7                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.47                                                                              | 0.72                                                                              | 0.66                                                                              | 0.80                                                                              | 0.62                                                                              | 0.48                                                                              | 0.76                                                                                | 0.71                                                                                | 0.60                                                                                | 0.71                                                                                | 0.81                                                                                | 0.78                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 0%                                                                                | 0%                                                                                | 0%                                                                                | 0%                                                                                | 1%                                                                                | 3%                                                                                | 5%                                                                                  | 5%                                                                                  | 0%                                                                                  | 0%                                                                                  | 2%                                                                                  | 3%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 36                                                                                | 259                                                                               | 0                                                                                 | 712                                                                               | 446                                                                               | 0                                                                                 | 145                                                                                 | 411                                                                                 | 0                                                                                   | 28                                                                                  | 1170                                                                                | 0                                                                                   |
| Turn Type               | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                                |                                                                                     |                                                                                     | Perm                                                                                |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   |                                                                                     | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   |                                                                                   | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 | 4                                                                                 |                                                                                   | 8                                                                                 | 8                                                                                 |                                                                                   | 6                                                                                   | 6                                                                                   |                                                                                     | 2                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 10.0                                                                              | 10.0                                                                              |                                                                                   | 10.0                                                                              | 10.0                                                                              |                                                                                   | 6.0                                                                                 | 6.0                                                                                 |                                                                                     | 6.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 15.7                                                                              | 15.7                                                                              |                                                                                   | 15.7                                                                              | 15.7                                                                              |                                                                                   | 11.5                                                                                | 11.5                                                                                |                                                                                     | 11.5                                                                                | 11.5                                                                                |                                                                                     |
| Total Split (s)         | 41.0                                                                              | 41.0                                                                              | 0.0                                                                               | 41.0                                                                              | 41.0                                                                              | 0.0                                                                               | 49.0                                                                                | 49.0                                                                                | 0.0                                                                                 | 49.0                                                                                | 49.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 45.6%                                                                             | 45.6%                                                                             | 0.0%                                                                              | 45.6%                                                                             | 45.6%                                                                             | 0.0%                                                                              | 54.4%                                                                               | 54.4%                                                                               | 0.0%                                                                                | 54.4%                                                                               | 54.4%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.9                                                                               | 3.9                                                                               |                                                                                   | 3.9                                                                               | 3.9                                                                               |                                                                                   | 3.6                                                                                 | 3.6                                                                                 |                                                                                     | 3.6                                                                                 | 3.6                                                                                 |                                                                                     |
| All-Red Time (s)        | 1.8                                                                               | 1.8                                                                               |                                                                                   | 1.8                                                                               | 1.8                                                                               |                                                                                   | 1.9                                                                                 | 1.9                                                                                 |                                                                                     | 1.9                                                                                 | 1.9                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 5.7                                                                               | 5.7                                                                               | 4.0                                                                               | 5.7                                                                               | 5.7                                                                               | 4.0                                                                               | 5.5                                                                                 | 5.5                                                                                 | 4.0                                                                                 | 5.5                                                                                 | 5.5                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Recall Mode             | Max                                                                               | Max                                                                               |                                                                                   | Max                                                                               | Max                                                                               |                                                                                   | C-Max                                                                               | C-Max                                                                               |                                                                                     | C-Max                                                                               | C-Max                                                                               |                                                                                     |
| Act Effect Green (s)    | 35.3                                                                              | 35.3                                                                              |                                                                                   | 35.3                                                                              | 35.3                                                                              |                                                                                   | 43.5                                                                                | 43.5                                                                                |                                                                                     | 43.5                                                                                | 43.5                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.39                                                                              | 0.39                                                                              |                                                                                   | 0.39                                                                              | 0.39                                                                              |                                                                                   | 0.48                                                                                | 0.48                                                                                |                                                                                     | 0.48                                                                                | 0.48                                                                                |                                                                                     |
| v/c Ratio               | 0.15                                                                              | 0.38                                                                              |                                                                                   | 1.77                                                                              | 0.61                                                                              |                                                                                   | 1.81                                                                                | 0.47                                                                                |                                                                                     | 0.07                                                                                | 1.31                                                                                |                                                                                     |
| Control Delay           | 19.7                                                                              | 17.0                                                                              |                                                                                   | 380.5                                                                             | 25.8                                                                              |                                                                                   | 430.8                                                                               | 13.4                                                                                |                                                                                     | 13.2                                                                                | 172.6                                                                               |                                                                                     |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                                 | 0.0                                                                                 |                                                                                     | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |
| Total Delay             | 19.7                                                                              | 17.0                                                                              |                                                                                   | 380.5                                                                             | 25.8                                                                              |                                                                                   | 430.8                                                                               | 13.4                                                                                |                                                                                     | 13.2                                                                                | 172.6                                                                               |                                                                                     |
| LOS                     | B                                                                                 | B                                                                                 |                                                                                   | F                                                                                 | C                                                                                 |                                                                                   | F                                                                                   | B                                                                                   |                                                                                     | B                                                                                   | F                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 17.3                                                                              |                                                                                   |                                                                                   | 243.9                                                                             |                                                                                   |                                                                                     | 122.3                                                                               |                                                                                     |                                                                                     | 168.8                                                                               |                                                                                     |
| Approach LOS            |                                                                                   | B                                                                                 |                                                                                   |                                                                                   | F                                                                                 |                                                                                   |                                                                                     | F                                                                                   |                                                                                     |                                                                                     | F                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 13                                                                                | 79                                                                                |                                                                                   | ~610                                                                              | 194                                                                               |                                                                                   | ~125                                                                                | 189                                                                                 |                                                                                     | 8                                                                                   | ~871                                                                                |                                                                                     |
| Queue Length 95th (ft)  | 17                                                                                | 101                                                                               |                                                                                   | #706                                                                              | 175                                                                               |                                                                                   | m#192                                                                               | 201                                                                                 |                                                                                     | 18                                                                                  | #952                                                                                |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 1656                                                                              |                                                                                   |                                                                                   | 1792                                                                              |                                                                                   |                                                                                    | 161                                                                                 |                                                                                     |                                                                                     | 431                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 100                                                                               |                                                                                   |                                                                                   | 500                                                                               |                                                                                   |                                                                                   | 150                                                                                |                                                                                     |                                                                                     | 80                                                                                  |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 245                                                                               | 682                                                                               |                                                                                   | 402                                                                               | 726                                                                               |                                                                                   | 80                                                                                 | 867                                                                                 |                                                                                     | 388                                                                                 | 892                                                                                 |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.15                                                                              | 0.38                                                                              |                                                                                   | 1.77                                                                              | 0.61                                                                              |                                                                                   | 1.81                                                                               | 0.47                                                                                |                                                                                     | 0.07                                                                                | 1.31                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 89 (99%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.81

Intersection Signal Delay: 173.9

Intersection LOS: F

Intersection Capacity Utilization 117.2%

ICU Level of Service H

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

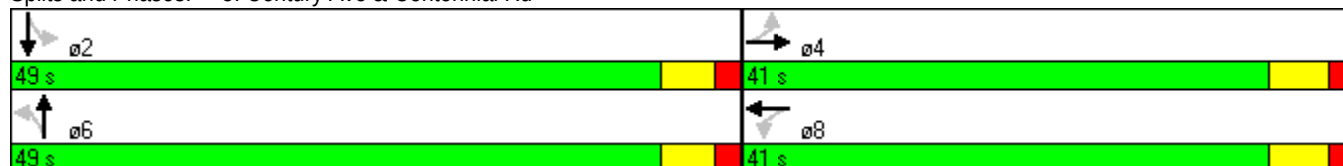
Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: Century Ave & Centennial Rd





**Appendix I: 2009 - Signal at Trenton PM (1B2)**

Exit 161 Operational Study  
Bismarck, ND

1: Divide Ave & Bismarck Expy

|                         |  |  |  |  |  |  |   |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |                                                                                   |  |  |  |  |  |  |  |  |  |
| Volume (vph)            | 231                                                                               | 45                                                                                | 20                                                                                | 55                                                                                | 45                                                                                | 201                                                                               | 24                                                                                  | 854                                                                                 | 60                                                                                  | 183                                                                                 | 779                                                                                 | 118                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 150                                                                               |                                                                                   | 0                                                                                 | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                 |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                   |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 100                                                                               |                                                                                   | 25                                                                                | 100                                                                               |                                                                                   | 100                                                                               | 100                                                                                 |                                                                                     | 150                                                                                 | 100                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 25                                                                                |                                                                                   |                                                                                   | 25                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 371                                                                               |                                                                                   |                                                                                   | 341                                                                               |                                                                                   |                                                                                     | 614                                                                                 |                                                                                     |                                                                                     | 458                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 10.1                                                                              |                                                                                   |                                                                                   | 9.3                                                                               |                                                                                   |                                                                                     | 10.5                                                                                |                                                                                     |                                                                                     | 7.8                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.85                                                                              | 0.80                                                                              | 0.63                                                                              | 0.63                                                                              | 0.56                                                                              | 0.75                                                                              | 0.75                                                                                | 0.80                                                                                | 0.83                                                                                | 0.88                                                                                | 0.87                                                                                | 0.87                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 1%                                                                                | 2%                                                                                | 0%                                                                                | 18%                                                                               | 7%                                                                                | 14%                                                                               | 8%                                                                                  | 2%                                                                                  | 10%                                                                                 | 10%                                                                                 | 4%                                                                                  | 4%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 272                                                                               | 88                                                                                | 0                                                                                 | 87                                                                                | 80                                                                                | 268                                                                               | 32                                                                                  | 1068                                                                                | 72                                                                                  | 208                                                                                 | 1031                                                                                | 0                                                                                   |
| Turn Type               | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                              |                                                                                   | pm+ov                                                                             | Perm                                                                                |                                                                                     | Perm                                                                                | pm+pt                                                                               |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 | 5                                                                                 |                                                                                     | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                   |                                                                                     | 6                                                                                   | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 | 4                                                                                 |                                                                                   | 8                                                                                 | 8                                                                                 | 5                                                                                 | 6                                                                                   | 6                                                                                   | 6                                                                                   | 5                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               | 6.0                                                                               |                                                                                   | 6.0                                                                               | 6.0                                                                               | 5.0                                                                               | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 5.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 30.0                                                                              | 30.0                                                                              |                                                                                   | 30.0                                                                              | 30.0                                                                              | 9.8                                                                               | 22.9                                                                                | 22.9                                                                                | 22.9                                                                                | 9.8                                                                                 | 28.7                                                                                |                                                                                     |
| Total Split (s)         | 31.0                                                                              | 31.0                                                                              | 0.0                                                                               | 31.0                                                                              | 31.0                                                                              | 17.0                                                                              | 42.0                                                                                | 42.0                                                                                | 42.0                                                                                | 17.0                                                                                | 59.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 34.4%                                                                             | 34.4%                                                                             | 0.0%                                                                              | 34.4%                                                                             | 34.4%                                                                             | 18.9%                                                                             | 46.7%                                                                               | 46.7%                                                                               | 46.7%                                                                               | 18.9%                                                                               | 65.6%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 3.0                                                                               | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 | 3.0                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 1.0                                                                               | 1.8                                                                                 | 1.8                                                                                 | 1.8                                                                                 | 1.0                                                                                 | 1.8                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 5.7                                                                                 | 5.7                                                                                 | 5.7                                                                                 | 4.0                                                                                 | 5.7                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lag                                                                               | Lead                                                                                | Lead                                                                                | Lead                                                                                | Lead                                                                                | Lag                                                                                 |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                               | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 |                                                                                     |
| Recall Mode             | None                                                                              | None                                                                              |                                                                                   | None                                                                              | None                                                                              | None                                                                              | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               | None                                                                                | C-Min                                                                               |                                                                                     |
| Act Effect Green (s)    | 22.0                                                                              | 22.0                                                                              |                                                                                   | 22.0                                                                              | 22.0                                                                              | 40.4                                                                              | 39.9                                                                                | 39.9                                                                                | 39.9                                                                                | 58.0                                                                                | 56.3                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.24                                                                              | 0.24                                                                              |                                                                                   | 0.24                                                                              | 0.24                                                                              | 0.45                                                                              | 0.44                                                                                | 0.44                                                                                | 0.44                                                                                | 0.64                                                                                | 0.63                                                                                |                                                                                     |
| v/c Ratio               | 0.84                                                                              | 0.19                                                                              |                                                                                   | 0.32                                                                              | 0.18                                                                              | 0.41                                                                              | 0.19                                                                                | 0.68                                                                                | 0.10                                                                                | 0.56                                                                                | 0.48                                                                                |                                                                                     |
| Control Delay           | 55.1                                                                              | 18.2                                                                              |                                                                                   | 30.1                                                                              | 26.7                                                                              | 16.1                                                                              | 21.1                                                                                | 23.7                                                                                | 4.8                                                                                 | 22.4                                                                                | 5.9                                                                                 |                                                                                     |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.1                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.2                                                                                 |                                                                                     |
| Total Delay             | 55.1                                                                              | 18.2                                                                              |                                                                                   | 30.1                                                                              | 26.7                                                                              | 16.1                                                                              | 21.1                                                                                | 23.8                                                                                | 4.8                                                                                 | 22.4                                                                                | 6.1                                                                                 |                                                                                     |
| LOS                     | E                                                                                 | B                                                                                 |                                                                                   | C                                                                                 | C                                                                                 | B                                                                                 | C                                                                                   | C                                                                                   | A                                                                                   | C                                                                                   | A                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 46.1                                                                              |                                                                                   |                                                                                   | 20.8                                                                              |                                                                                   |                                                                                     | 22.5                                                                                |                                                                                     |                                                                                     | 8.8                                                                                 |                                                                                     |
| Approach LOS            |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | C                                                                                 |                                                                                   |                                                                                     | C                                                                                   |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 143                                                                               | 24                                                                                |                                                                                   | 39                                                                                | 35                                                                                | 82                                                                                | 11                                                                                  | 261                                                                                 | 0                                                                                   | 44                                                                                  | 81                                                                                  |                                                                                     |
| Queue Length 95th (ft)  | #223                                                                              | 51                                                                                |                                                                                   | 53                                                                                | 42                                                                                | 107                                                                               | 27                                                                                  | 287                                                                                 | 21                                                                                  | 99                                                                                  | 115                                                                                 |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 291                                                                               |                                                                                   |                                                                                   | 261                                                                               |                                                                                   |                                                                                     | 534                                                                                 |                                                                                     |                                                                                     | 378                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 150                                                                               |                                                                                   |                                                                                   | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                 |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 368                                                                               | 516                                                                               |                                                                                   | 313                                                                               | 493                                                                               | 649                                                                               | 168                                                                                 | 1569                                                                                | 691                                                                                 | 384                                                                                 | 2142                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 349                                                                                 |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 42                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.74                                                                              | 0.17                                                                              |                                                                                   | 0.28                                                                              | 0.16                                                                              | 0.41                                                                              | 0.19                                                                                | 0.70                                                                                | 0.10                                                                                | 0.54                                                                                | 0.58                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 33 (37%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.84

Intersection Signal Delay: 19.6

Intersection LOS: B

Intersection Capacity Utilization 66.3%

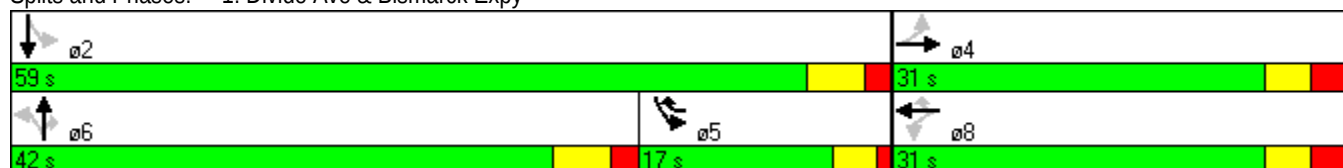
ICU Level of Service C

Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 1: Divide Ave & Bismarck Expy



|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |                                                                                   |  |                                                                                   |                                                                                   |                                                                                   |                                                                                    |  |  |  |  |  |
| Volume (vph)            | 213                                                                               | 0                                                                                 | 286                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 1134                                                                                | 111                                                                                 | 27                                                                                  | 557                                                                                 | 0                                                                                   |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 16                                                                                | 12                                                                                | 12                                                                                | 12                                                                                 | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 0                                                                                 |                                                                                   | 175                                                                               | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  |                                                                                     | 0                                                                                   | 222                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 1                                                                                 |                                                                                   | 1                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 300                                                                               | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                 |                                                                                     | 25                                                                                  | 150                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                    |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                    | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 575                                                                               |                                                                                   |                                                                                   | 383                                                                               |                                                                                   |                                                                                    | 458                                                                                 |                                                                                     |                                                                                     | 769                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 13.1                                                                              |                                                                                   |                                                                                   | 8.7                                                                               |                                                                                   |                                                                                    | 7.8                                                                                 |                                                                                     |                                                                                     | 13.1                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.73                                                                              | 0.92                                                                              | 0.78                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                               | 0.83                                                                                | 0.79                                                                                | 0.61                                                                                | 0.97                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                               | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 3%                                                                                | 2%                                                                                | 12%                                                                               | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                 | 2%                                                                                  | 16%                                                                                 | 7%                                                                                  | 10%                                                                                 | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 292                                                                               | 0                                                                                 | 367                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 1366                                                                                | 141                                                                                 | 44                                                                                  | 574                                                                                 | 0                                                                                   |
| Turn Type               | custom                                                                            |                                                                                   | custom                                                                            |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     | Perm                                                                                | Perm                                                                                |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     | 6                                                                                   | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                   | 6                                                                                   | 2                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               |                                                                                   | 6.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 21.1                                                                              |                                                                                   | 21.1                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 23.4                                                                                | 23.4                                                                                | 21.4                                                                                | 21.4                                                                                |                                                                                     |
| Total Split (s)         | 33.0                                                                              | 0.0                                                                               | 33.0                                                                              | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 57.0                                                                                | 57.0                                                                                | 57.0                                                                                | 57.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 36.7%                                                                             | 0.0%                                                                              | 36.7%                                                                             | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                               | 63.3%                                                                               | 63.3%                                                                               | 63.3%                                                                               | 63.3%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.6                                                                               |                                                                                   | 3.6                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 1.5                                                                               |                                                                                   | 1.5                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 1.5                                                                                 | 1.5                                                                                 | 1.5                                                                                 | 1.5                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 5.1                                                                               | 4.0                                                                               | 5.1                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                                | 5.4                                                                                 | 5.4                                                                                 | 5.4                                                                                 | 5.4                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Recall Mode             | None                                                                              |                                                                                   | None                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               |                                                                                     |
| Act Effct Green (s)     | 20.5                                                                              |                                                                                   | 20.5                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 59.0                                                                                | 59.0                                                                                | 59.0                                                                                | 59.0                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.23                                                                              |                                                                                   | 0.23                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.66                                                                                | 0.66                                                                                | 0.66                                                                                | 0.66                                                                                |                                                                                     |
| v/c Ratio               | 0.73                                                                              |                                                                                   | 0.66                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.59                                                                                | 0.15                                                                                | 0.26                                                                                | 0.27                                                                                |                                                                                     |
| Control Delay           | 42.6                                                                              |                                                                                   | 12.5                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 7.1                                                                                 | 0.5                                                                                 | 7.5                                                                                 | 4.6                                                                                 |                                                                                     |
| Queue Delay             | 0.0                                                                               |                                                                                   | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.5                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |
| Total Delay             | 42.6                                                                              |                                                                                   | 12.5                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 7.6                                                                                 | 0.5                                                                                 | 7.5                                                                                 | 4.6                                                                                 |                                                                                     |
| LOS                     | D                                                                                 |                                                                                   | B                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | A                                                                                   | A                                                                                   | A                                                                                   | A                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 7.0                                                                                 |                                                                                     |                                                                                     | 4.8                                                                                 |                                                                                     |
| Approach LOS            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | A                                                                                   |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 155                                                                               |                                                                                   | 33                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 116                                                                                 | 0                                                                                   | 6                                                                                   | 47                                                                                  |                                                                                     |
| Queue Length 95th (ft)  | 167                                                                               |                                                                                   | 63                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 169                                                                                 | m2                                                                                  | 5                                                                                   | 27                                                                                  |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 495                                                                               |                                                                                   |                                                                                   | 303                                                                               |                                                                                   |                                                                                    | 378                                                                                 |                                                                                     |                                                                                     | 689                                                                                 |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   | 175                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | 222                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 543                                                                               |                                                                                   | 652                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 2320                                                                                | 961                                                                                 | 171                                                                                 | 2152                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 481                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.54                                                                              |                                                                                   | 0.56                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.74                                                                                | 0.15                                                                                | 0.26                                                                                | 0.27                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 37 (41%), Referenced to phase 2:SBTL and 6:NBT, Start of Green

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.73

Intersection Signal Delay: 10.9

Intersection LOS: B

Intersection Capacity Utilization 61.4%

ICU Level of Service B

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: South Ramp & Bismarck Expy

|                                                                                        |                                                                                        |
|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
|  Ø2  |  Ø4 |
| 57 s                                                                                   | 33 s                                                                                   |
|  Ø6 |                                                                                        |
| 57 s                                                                                   |                                                                                        |

|                         |  |      |      |                                                                                   |      |                                                                                     |                                                                                     |                                                                                     |      |      |                                                                                     |      |
|-------------------------|------------------------------------------------------------------------------------|------|------|-----------------------------------------------------------------------------------|------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------|------|-------------------------------------------------------------------------------------|------|
| Lane Group              | EBL                                                                                | EBT  | EBR  | WBL                                                                               | WBT  | WBR                                                                                 | NBL                                                                                 | NBT                                                                                 | NBR  | SBL  | SBT                                                                                 | SBR  |
| Lane Configurations     |                                                                                    |      |      |  |      |  |  |  |      |      |  |      |
| Volume (vph)            | 0                                                                                  | 0    | 0    | 99                                                                                | 0    | 21                                                                                  | 371                                                                                 | 1055                                                                                | 0    | 0    | 536                                                                                 | 149  |
| Ideal Flow (vphpl)      | 1900                                                                               | 1900 | 1900 | 1900                                                                              | 1900 | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900 | 1900 | 1900                                                                                | 1900 |
| Lane Width (ft)         | 12                                                                                 | 12   | 12   | 16                                                                                | 12   | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12   | 12   | 12                                                                                  | 12   |
| Grade (%)               |                                                                                    | 0%   |      |                                                                                   | 0%   |                                                                                     |                                                                                     | 0%                                                                                  |      |      | 0%                                                                                  |      |
| Storage Length (ft)     | 0                                                                                  |      | 0    | 0                                                                                 |      | 150                                                                                 | 215                                                                                 |                                                                                     | 0    | 0    |                                                                                     | 0    |
| Storage Lanes           | 0                                                                                  |      | 0    | 1                                                                                 |      | 1                                                                                   | 1                                                                                   |                                                                                     | 0    | 0    |                                                                                     | 0    |
| Taper Length (ft)       | 25                                                                                 |      | 25   | 25                                                                                |      | 100                                                                                 | 150                                                                                 |                                                                                     | 25   | 25   |                                                                                     | 25   |
| Right Turn on Red       |                                                                                    |      | Yes  |                                                                                   |      | Yes                                                                                 |                                                                                     |                                                                                     | Yes  |      |                                                                                     | Yes  |
| Link Speed (mph)        |                                                                                    | 30   |      |                                                                                   | 30   |                                                                                     |                                                                                     | 40                                                                                  |      |      | 40                                                                                  |      |
| Link Distance (ft)      |                                                                                    | 270  |      |                                                                                   | 465  |                                                                                     |                                                                                     | 769                                                                                 |      |      | 782                                                                                 |      |
| Travel Time (s)         |                                                                                    | 6.1  |      |                                                                                   | 10.6 |                                                                                     |                                                                                     | 13.1                                                                                |      |      | 13.3                                                                                |      |
| Confl. Peds. (#/hr)     |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     |                                                                                     |      |      |                                                                                     |      |
| Confl. Bikes (#/hr)     |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     |                                                                                     |      |      |                                                                                     |      |
| Peak Hour Factor        | 0.92                                                                               | 0.92 | 0.92 | 0.85                                                                              | 0.25 | 0.48                                                                                | 0.69                                                                                | 0.93                                                                                | 0.92 | 0.92 | 0.96                                                                                | 0.93 |
| Growth Factor           | 100%                                                                               | 100% | 100% | 100%                                                                              | 100% | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100% | 100% | 100%                                                                                | 100% |
| Heavy Vehicles (%)      | 2%                                                                                 | 2%   | 2%   | 20%                                                                               | 0%   | 0%                                                                                  | 3%                                                                                  | 1%                                                                                  | 2%   | 2%   | 4%                                                                                  | 1%   |
| Bus Blockages (#/hr)    | 0                                                                                  | 0    | 0    | 0                                                                                 | 0    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0    | 0    | 0                                                                                   | 0    |
| Parking (#/hr)          |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     |                                                                                     |      |      |                                                                                     |      |
| Mid-Block Traffic (%)   |                                                                                    | 0%   |      |                                                                                   | 0%   |                                                                                     |                                                                                     | 0%                                                                                  |      |      | 0%                                                                                  |      |
| Shared Lane Traffic (%) |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     |                                                                                     |      |      |                                                                                     |      |
| Lane Group Flow (vph)   | 0                                                                                  | 0    | 0    | 116                                                                               | 0    | 44                                                                                  | 538                                                                                 | 1134                                                                                | 0    | 0    | 718                                                                                 | 0    |
| Turn Type               |                                                                                    |      |      | custom                                                                            |      | custom                                                                              | pm+pt                                                                               |                                                                                     |      |      |                                                                                     |      |
| Protected Phases        |                                                                                    |      |      |                                                                                   |      |                                                                                     | 1                                                                                   | 6                                                                                   |      |      | 2                                                                                   |      |
| Permitted Phases        |                                                                                    |      |      | 8                                                                                 |      | 8                                                                                   | 6                                                                                   |                                                                                     |      |      |                                                                                     |      |
| Detector Phase          |                                                                                    |      |      | 8                                                                                 |      | 8                                                                                   | 1                                                                                   | 6                                                                                   |      |      | 2                                                                                   |      |
| Switch Phase            |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     |                                                                                     |      |      |                                                                                     |      |
| Minimum Initial (s)     |                                                                                    |      |      | 5.0                                                                               |      | 5.0                                                                                 | 5.0                                                                                 | 10.0                                                                                |      |      | 10.0                                                                                |      |
| Minimum Split (s)       |                                                                                    |      |      | 20.0                                                                              |      | 20.0                                                                                | 9.0                                                                                 | 20.0                                                                                |      |      | 22.4                                                                                |      |
| Total Split (s)         | 0.0                                                                                | 0.0  | 0.0  | 20.0                                                                              | 0.0  | 20.0                                                                                | 38.0                                                                                | 70.0                                                                                | 0.0  | 0.0  | 32.0                                                                                | 0.0  |
| Total Split (%)         | 0.0%                                                                               | 0.0% | 0.0% | 22.2%                                                                             | 0.0% | 22.2%                                                                               | 42.2%                                                                               | 77.8%                                                                               | 0.0% | 0.0% | 35.6%                                                                               | 0.0% |
| Yellow Time (s)         |                                                                                    |      |      | 3.2                                                                               |      | 3.2                                                                                 | 3.0                                                                                 | 3.9                                                                                 |      |      | 3.9                                                                                 |      |
| All-Red Time (s)        |                                                                                    |      |      | 2.0                                                                               |      | 2.0                                                                                 | 1.0                                                                                 | 1.5                                                                                 |      |      | 1.5                                                                                 |      |
| Lost Time Adjust (s)    | 0.0                                                                                | 0.0  | 0.0  | 0.0                                                                               | 0.0  | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0  | 0.0  | 0.0                                                                                 | 0.0  |
| Total Lost Time (s)     | 4.0                                                                                | 4.0  | 4.0  | 5.2                                                                               | 4.0  | 5.2                                                                                 | 4.0                                                                                 | 5.4                                                                                 | 4.0  | 4.0  | 5.4                                                                                 | 4.0  |
| Lead/Lag                |                                                                                    |      |      |                                                                                   |      |                                                                                     | Lag                                                                                 |                                                                                     |      |      | Lead                                                                                |      |
| Lead-Lag Optimize?      |                                                                                    |      |      |                                                                                   |      |                                                                                     | Yes                                                                                 |                                                                                     |      |      | Yes                                                                                 |      |
| Recall Mode             |                                                                                    |      |      | None                                                                              |      | None                                                                                | None                                                                                | C-Min                                                                               |      |      | C-Min                                                                               |      |
| Act Effect Green (s)    |                                                                                    |      |      | 10.4                                                                              |      | 10.4                                                                                | 72.6                                                                                | 72.3                                                                                |      |      | 48.9                                                                                |      |
| Actuated g/C Ratio      |                                                                                    |      |      | 0.12                                                                              |      | 0.12                                                                                | 0.81                                                                                | 0.80                                                                                |      |      | 0.54                                                                                |      |
| v/c Ratio               |                                                                                    |      |      | 0.59                                                                              |      | 0.19                                                                                | 0.73                                                                                | 0.40                                                                                |      |      | 0.39                                                                                |      |
| Control Delay           |                                                                                    |      |      | 49.1                                                                              |      | 12.8                                                                                | 10.8                                                                                | 1.6                                                                                 |      |      | 13.5                                                                                |      |
| Queue Delay             |                                                                                    |      |      | 0.0                                                                               |      | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |      |      | 0.0                                                                                 |      |
| Total Delay             |                                                                                    |      |      | 49.1                                                                              |      | 12.8                                                                                | 10.8                                                                                | 1.6                                                                                 |      |      | 13.5                                                                                |      |
| LOS                     |                                                                                    |      |      | D                                                                                 |      | B                                                                                   | B                                                                                   | A                                                                                   |      |      | B                                                                                   |      |
| Approach Delay          |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     | 4.5                                                                                 |      |      | 13.5                                                                                |      |
| Approach LOS            |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     | A                                                                                   |      |      | B                                                                                   |      |
| Queue Length 50th (ft)  |                                                                                    |      |      | 64                                                                                |      | 0                                                                                   | 55                                                                                  | 30                                                                                  |      |      | 117                                                                                 |      |
| Queue Length 95th (ft)  |                                                                                    |      |      | 105                                                                               |      | 5                                                                                   | 42                                                                                  | 62                                                                                  |      |      | m156                                                                                |      |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 190                                                                               |                                                                                   |                                                                                   | 385                                                                               |                                                                                   |                                                                                    | 689                                                                                 |                                                                                     |                                                                                     | 702                                                                                 |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 150                                                                               | 215                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Base Capacity (vph)     |                                                                                   |                                                                                   |                                                                                   | 280                                                                               |                                                                                   | 302                                                                               | 996                                                                                | 2870                                                                                |                                                                                     |                                                                                     | 1853                                                                                |                                                                                     |
| Starvation Cap Reductn  |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     |                                                                                     | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     |                                                                                     | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     |                                                                                     | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       |                                                                                   |                                                                                   |                                                                                   | 0.41                                                                              |                                                                                   | 0.15                                                                              | 0.54                                                                               | 0.40                                                                                |                                                                                     |                                                                                     | 0.39                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 34 (38%), Referenced to phase 2:SBT and 6:NBTL, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.73

Intersection Signal Delay: 9.2

Intersection LOS: A

Intersection Capacity Utilization 61.4%

ICU Level of Service B

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: North Ramp & Centennial Rd



|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |                                                                                   |  |                                                                                   |                                                                                   |  |                                                                                   |  |  |                                                                                     |                                                                                     |  |  |
| Volume (vph)            | 12                                                                                | 2                                                                                 | 73                                                                                | 101                                                                               | 0                                                                                 | 64                                                                                | 115                                                                                 | 1193                                                                                | 216                                                                                 | 39                                                                                  | 608                                                                                 | 17                                                                                  |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 0                                                                                 |                                                                                   | 215                                                                               | 0                                                                                 |                                                                                   | 215                                                                               | 530                                                                                 |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     | 115                                                                                 |
| Storage Lanes           | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     | 1                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                  |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 1750                                                                              |                                                                                   |                                                                                   | 324                                                                               |                                                                                   |                                                                                     | 782                                                                                 |                                                                                     |                                                                                     | 292                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 39.8                                                                              |                                                                                   |                                                                                   | 7.4                                                                               |                                                                                   |                                                                                     | 13.3                                                                                |                                                                                     |                                                                                     | 5.0                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.70                                                                              | 0.50                                                                              | 0.70                                                                              | 0.74                                                                              | 0.25                                                                              | 0.64                                                                              | 0.74                                                                                | 0.65                                                                                | 0.84                                                                                | 0.65                                                                                | 0.76                                                                                | 0.43                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 0%                                                                                | 0%                                                                                | 0%                                                                                | 0%                                                                                | 0%                                                                                | 2%                                                                                | 0%                                                                                  | 1%                                                                                  | 1%                                                                                  | 0%                                                                                  | 3%                                                                                  | 6%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 0                                                                                 | 125                                                                               | 0                                                                                 | 0                                                                                 | 236                                                                               | 0                                                                                 | 155                                                                                 | 2092                                                                                | 0                                                                                   | 0                                                                                   | 860                                                                                 | 40                                                                                  |
| Turn Type               | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                              |                                                                                   |                                                                                   | pm+pt                                                                               |                                                                                     |                                                                                     | pm+pt                                                                               |                                                                                     | Perm                                                                                |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   |                                                                                   | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     | 2                                                                                   |
| Detector Phase          | 4                                                                                 | 4                                                                                 |                                                                                   | 8                                                                                 | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   | 2                                                                                   |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 4.0                                                                               | 4.0                                                                               |                                                                                   | 4.0                                                                               | 4.0                                                                               |                                                                                   | 5.0                                                                                 | 8.0                                                                                 |                                                                                     | 5.0                                                                                 | 8.0                                                                                 | 8.0                                                                                 |
| Minimum Split (s)       | 20.0                                                                              | 20.0                                                                              |                                                                                   | 20.0                                                                              | 20.0                                                                              |                                                                                   | 12.0                                                                                | 20.0                                                                                |                                                                                     | 9.0                                                                                 | 20.0                                                                                | 20.0                                                                                |
| Total Split (s)         | 20.0                                                                              | 20.0                                                                              | 0.0                                                                               | 20.0                                                                              | 20.0                                                                              | 0.0                                                                               | 12.0                                                                                | 58.0                                                                                | 0.0                                                                                 | 12.0                                                                                | 58.0                                                                                | 58.0                                                                                |
| Total Split (%)         | 22.2%                                                                             | 22.2%                                                                             | 0.0%                                                                              | 22.2%                                                                             | 22.2%                                                                             | 0.0%                                                                              | 13.3%                                                                               | 64.4%                                                                               | 0.0%                                                                                | 13.3%                                                                               | 64.4%                                                                               | 64.4%                                                                               |
| Yellow Time (s)         | 3.5                                                                               | 3.5                                                                               |                                                                                   | 3.5                                                                               | 3.5                                                                               |                                                                                   | 3.5                                                                                 | 3.5                                                                                 |                                                                                     | 3.5                                                                                 | 3.5                                                                                 | 3.5                                                                                 |
| All-Red Time (s)        | 0.5                                                                               | 0.5                                                                               |                                                                                   | 0.5                                                                               | 0.5                                                                               |                                                                                   | 0.5                                                                                 | 0.5                                                                                 |                                                                                     | 0.5                                                                                 | 0.5                                                                                 | 0.5                                                                                 |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lead                                                                                | Lag                                                                                 |                                                                                     | Lead                                                                                | Lag                                                                                 | Lag                                                                                 |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                                 | Yes                                                                                 |                                                                                     | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 |
| Recall Mode             | None                                                                              | None                                                                              |                                                                                   | None                                                                              | None                                                                              |                                                                                   | None                                                                                | C-Min                                                                               |                                                                                     | None                                                                                | C-Min                                                                               | C-Min                                                                               |
| Act Effct Green (s)     |                                                                                   | 16.0                                                                              |                                                                                   |                                                                                   | 16.0                                                                              |                                                                                   | 66.0                                                                                | 66.0                                                                                |                                                                                     |                                                                                     | 54.6                                                                                | 54.6                                                                                |
| Actuated g/C Ratio      |                                                                                   | 0.18                                                                              |                                                                                   |                                                                                   | 0.18                                                                              |                                                                                   | 0.73                                                                                | 0.73                                                                                |                                                                                     |                                                                                     | 0.61                                                                                | 0.61                                                                                |
| v/c Ratio               |                                                                                   | 0.34                                                                              |                                                                                   |                                                                                   | 0.97                                                                              |                                                                                   | 0.46                                                                                | 0.81                                                                                |                                                                                     |                                                                                     | 1.29                                                                                | 0.04                                                                                |
| Control Delay           |                                                                                   | 12.3                                                                              |                                                                                   |                                                                                   | 83.6                                                                              |                                                                                   | 8.3                                                                                 | 10.6                                                                                |                                                                                     |                                                                                     | 160.9                                                                               | 1.8                                                                                 |
| Queue Delay             |                                                                                   | 0.0                                                                               |                                                                                   |                                                                                   | 0.0                                                                               |                                                                                   | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |                                                                                     | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             |                                                                                   | 12.3                                                                              |                                                                                   |                                                                                   | 83.6                                                                              |                                                                                   | 8.3                                                                                 | 10.6                                                                                |                                                                                     |                                                                                     | 160.9                                                                               | 1.8                                                                                 |
| LOS                     |                                                                                   | B                                                                                 |                                                                                   |                                                                                   | F                                                                                 |                                                                                   | A                                                                                   | B                                                                                   |                                                                                     |                                                                                     | F                                                                                   | A                                                                                   |
| Approach Delay          |                                                                                   | 12.3                                                                              |                                                                                   |                                                                                   | 83.6                                                                              |                                                                                   |                                                                                     | 10.5                                                                                |                                                                                     |                                                                                     | 153.8                                                                               |                                                                                     |
| Approach LOS            |                                                                                   | B                                                                                 |                                                                                   |                                                                                   | F                                                                                 |                                                                                   |                                                                                     | B                                                                                   |                                                                                     |                                                                                     | F                                                                                   |                                                                                     |
| Queue Length 50th (ft)  |                                                                                   | 10                                                                                |                                                                                   |                                                                                   | 116                                                                               |                                                                                   | 23                                                                                  | 445                                                                                 |                                                                                     |                                                                                     | ~646                                                                                | 0                                                                                   |
| Queue Length 95th (ft)  |                                                                                   | 8                                                                                 |                                                                                   |                                                                                   | 31                                                                                |                                                                                   | 15                                                                                  | 98                                                                                  |                                                                                     |                                                                                     | #678                                                                                | 1                                                                                   |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 1670                                                                              |                                                                                   |                                                                                   | 244                                                                               |                                                                                   |                                                                                    | 702                                                                                 |                                                                                     |                                                                                     | 212                                                                                 |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 530                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     | 115                                                                                 |
| Base Capacity (vph)     |                                                                                   | 369                                                                               |                                                                                   |                                                                                   | 244                                                                               |                                                                                   | 349                                                                                | 2582                                                                                |                                                                                     |                                                                                     | 666                                                                                 | 935                                                                                 |
| Starvation Cap Reductn  |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     |                                                                                     | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     |                                                                                     | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     |                                                                                     | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       |                                                                                   | 0.34                                                                              |                                                                                   |                                                                                   | 0.97                                                                              |                                                                                   | 0.44                                                                               | 0.81                                                                                |                                                                                     |                                                                                     | 1.29                                                                                | 0.04                                                                                |

#### Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 60 (67%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 110

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.29

Intersection Signal Delay: 52.2

Intersection LOS: D

Intersection Capacity Utilization 100.2%

ICU Level of Service G

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 4: Trenton Dr & Centennial Rd

|                                                                                        |                                                                                        |                                                                                          |
|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
|  ø1 |  ø2 |  ø4 |
| 12 s                                                                                   | 58 s                                                                                   | 20 s                                                                                     |
|  ø5 |  ø6 |  ø8 |
| 12 s                                                                                   | 58 s                                                                                   | 20 s                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |                                                                                   |  |  |                                                                                   |  |  |                                                                                     |  |  |                                                                                     |
| Volume (vph)            | 54                                                                                | 166                                                                               | 140                                                                               | 117                                                                               | 94                                                                                | 23                                                                                | 152                                                                                 | 482                                                                                 | 207                                                                                 | 35                                                                                  | 241                                                                                 | 30                                                                                  |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 100                                                                               |                                                                                   | 0                                                                                 | 500                                                                               |                                                                                   | 0                                                                                 | 150                                                                                 |                                                                                     | 0                                                                                   | 80                                                                                  |                                                                                     | 0                                                                                   |
| Storage Lanes           | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                   |                                                                                     | 0                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                  |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 35                                                                                |                                                                                   |                                                                                   | 35                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 1745                                                                              |                                                                                   |                                                                                   | 1835                                                                              |                                                                                   |                                                                                     | 258                                                                                 |                                                                                     |                                                                                     | 489                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 34.0                                                                              |                                                                                   |                                                                                   | 35.7                                                                              |                                                                                   |                                                                                     | 4.4                                                                                 |                                                                                     |                                                                                     | 8.3                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.84                                                                              | 0.68                                                                              | 0.90                                                                              | 0.79                                                                              | 0.84                                                                              | 0.58                                                                              | 0.76                                                                                | 0.92                                                                                | 0.78                                                                                | 0.80                                                                                | 0.96                                                                                | 0.83                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                | 1%                                                                                | 3%                                                                                | 2%                                                                                | 0%                                                                                | 4%                                                                                | 2%                                                                                  | 3%                                                                                  | 1%                                                                                  | 3%                                                                                  | 5%                                                                                  | 3%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 64                                                                                | 400                                                                               | 0                                                                                 | 148                                                                               | 152                                                                               | 0                                                                                 | 200                                                                                 | 789                                                                                 | 0                                                                                   | 44                                                                                  | 287                                                                                 | 0                                                                                   |
| Turn Type               | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                                |                                                                                     |                                                                                     | Perm                                                                                |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   |                                                                                     | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   |                                                                                   | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 | 4                                                                                 |                                                                                   | 8                                                                                 | 8                                                                                 |                                                                                   | 6                                                                                   | 6                                                                                   |                                                                                     | 2                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 10.0                                                                              | 10.0                                                                              |                                                                                   | 10.0                                                                              | 10.0                                                                              |                                                                                   | 6.0                                                                                 | 6.0                                                                                 |                                                                                     | 6.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 15.7                                                                              | 15.7                                                                              |                                                                                   | 15.7                                                                              | 15.7                                                                              |                                                                                   | 11.5                                                                                | 11.5                                                                                |                                                                                     | 11.5                                                                                | 11.5                                                                                |                                                                                     |
| Total Split (s)         | 36.0                                                                              | 36.0                                                                              | 0.0                                                                               | 36.0                                                                              | 36.0                                                                              | 0.0                                                                               | 54.0                                                                                | 54.0                                                                                | 0.0                                                                                 | 54.0                                                                                | 54.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 40.0%                                                                             | 40.0%                                                                             | 0.0%                                                                              | 40.0%                                                                             | 40.0%                                                                             | 0.0%                                                                              | 60.0%                                                                               | 60.0%                                                                               | 0.0%                                                                                | 60.0%                                                                               | 60.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.9                                                                               | 3.9                                                                               |                                                                                   | 3.9                                                                               | 3.9                                                                               |                                                                                   | 3.6                                                                                 | 3.6                                                                                 |                                                                                     | 3.6                                                                                 | 3.6                                                                                 |                                                                                     |
| All-Red Time (s)        | 1.8                                                                               | 1.8                                                                               |                                                                                   | 1.8                                                                               | 1.8                                                                               |                                                                                   | 1.9                                                                                 | 1.9                                                                                 |                                                                                     | 1.9                                                                                 | 1.9                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 5.7                                                                               | 5.7                                                                               | 4.0                                                                               | 5.7                                                                               | 5.7                                                                               | 4.0                                                                               | 5.5                                                                                 | 5.5                                                                                 | 4.0                                                                                 | 5.5                                                                                 | 5.5                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Recall Mode             | Max                                                                               | Max                                                                               |                                                                                   | Max                                                                               | Max                                                                               |                                                                                   | C-Max                                                                               | C-Max                                                                               |                                                                                     | C-Max                                                                               | C-Max                                                                               |                                                                                     |
| Act Effct Green (s)     | 30.3                                                                              | 30.3                                                                              |                                                                                   | 30.3                                                                              | 30.3                                                                              |                                                                                   | 48.5                                                                                | 48.5                                                                                |                                                                                     | 48.5                                                                                | 48.5                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.34                                                                              | 0.34                                                                              |                                                                                   | 0.34                                                                              | 0.34                                                                              |                                                                                   | 0.54                                                                                | 0.54                                                                                |                                                                                     | 0.54                                                                                | 0.54                                                                                |                                                                                     |
| v/c Ratio               | 0.15                                                                              | 0.65                                                                              |                                                                                   | 0.72                                                                              | 0.24                                                                              |                                                                                   | 0.36                                                                                | 0.81                                                                                |                                                                                     | 0.27                                                                                | 0.30                                                                                |                                                                                     |
| Control Delay           | 22.3                                                                              | 28.5                                                                              |                                                                                   | 48.4                                                                              | 19.6                                                                              |                                                                                   | 7.4                                                                                 | 12.9                                                                                |                                                                                     | 16.7                                                                                | 11.9                                                                                |                                                                                     |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                                 | 0.0                                                                                 |                                                                                     | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |
| Total Delay             | 22.3                                                                              | 28.5                                                                              |                                                                                   | 48.4                                                                              | 19.6                                                                              |                                                                                   | 7.4                                                                                 | 12.9                                                                                |                                                                                     | 16.7                                                                                | 11.9                                                                                |                                                                                     |
| LOS                     | C                                                                                 | C                                                                                 |                                                                                   | D                                                                                 | B                                                                                 |                                                                                   | A                                                                                   | B                                                                                   |                                                                                     | B                                                                                   | B                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 27.7                                                                              |                                                                                   |                                                                                   | 33.8                                                                              |                                                                                   |                                                                                     | 11.8                                                                                |                                                                                     |                                                                                     | 12.5                                                                                |                                                                                     |
| Approach LOS            |                                                                                   | C                                                                                 |                                                                                   |                                                                                   | C                                                                                 |                                                                                   |                                                                                     | B                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 25                                                                                | 172                                                                               |                                                                                   | 73                                                                                | 52                                                                                |                                                                                   | 17                                                                                  | 81                                                                                  |                                                                                     | 13                                                                                  | 80                                                                                  |                                                                                     |
| Queue Length 95th (ft)  | 51                                                                                | 180                                                                               |                                                                                   | #136                                                                              | 90                                                                                |                                                                                   | m40                                                                                 | m145                                                                                |                                                                                     | 32                                                                                  | 130                                                                                 |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 1665                                                                              |                                                                                   |                                                                                   | 1755                                                                              |                                                                                   |                                                                                    | 178                                                                                 |                                                                                     |                                                                                     | 409                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 100                                                                               |                                                                                   |                                                                                   | 500                                                                               |                                                                                   |                                                                                   | 150                                                                                |                                                                                     |                                                                                     | 80                                                                                  |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 414                                                                               | 617                                                                               |                                                                                   | 206                                                                               | 623                                                                               |                                                                                   | 557                                                                                | 971                                                                                 |                                                                                     | 163                                                                                 | 964                                                                                 |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.15                                                                              | 0.65                                                                              |                                                                                   | 0.72                                                                              | 0.24                                                                              |                                                                                   | 0.36                                                                               | 0.81                                                                                |                                                                                     | 0.27                                                                                | 0.30                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 73 (81%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.81

Intersection Signal Delay: 18.6

Intersection LOS: B

Intersection Capacity Utilization 87.3%

ICU Level of Service E

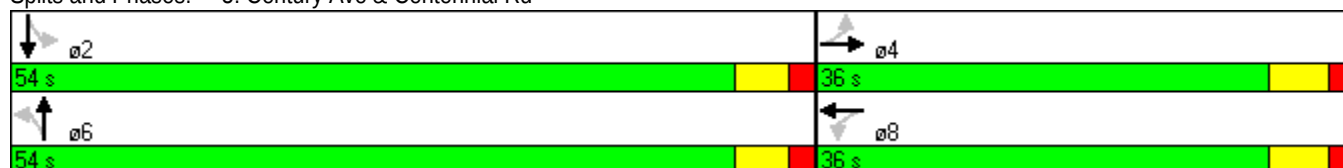
Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: Century Ave & Centennial Rd





## **Appendix J: 2024 - Existing Control AM (2A1)**

Exit 161 Operational Study  
Bismarck, ND

1: Divide Ave & Bismarck Expy

|                         |  |  |  |  |  |  |   |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |                                                                                   |  |  |  |  |  |  |  |  |  |
| Volume (vph)            | 106                                                                               | 114                                                                               | 16                                                                                | 110                                                                               | 75                                                                                | 258                                                                               | 25                                                                                  | 430                                                                                 | 72                                                                                  | 370                                                                                 | 1268                                                                                | 283                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 150                                                                               |                                                                                   | 0                                                                                 | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                 |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                   |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 100                                                                               |                                                                                   | 25                                                                                | 100                                                                               |                                                                                   | 100                                                                               | 100                                                                                 |                                                                                     | 150                                                                                 | 100                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 25                                                                                |                                                                                   |                                                                                   | 25                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 371                                                                               |                                                                                   |                                                                                   | 341                                                                               |                                                                                   |                                                                                     | 614                                                                                 |                                                                                     |                                                                                     | 458                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 10.1                                                                              |                                                                                   |                                                                                   | 9.3                                                                               |                                                                                   |                                                                                     | 10.5                                                                                |                                                                                     |                                                                                     | 7.8                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 13%                                                                               | 5%                                                                                | 0%                                                                                | 6%                                                                                | 17%                                                                               | 26%                                                                               | 4%                                                                                  | 9%                                                                                  | 18%                                                                                 | 2%                                                                                  | 1%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 115                                                                               | 141                                                                               | 0                                                                                 | 120                                                                               | 82                                                                                | 280                                                                               | 27                                                                                  | 467                                                                                 | 78                                                                                  | 402                                                                                 | 1686                                                                                | 0                                                                                   |
| Turn Type               | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                              |                                                                                   | pm+ov                                                                             | Perm                                                                                |                                                                                     | Perm                                                                                | pm+pt                                                                               |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 | 5                                                                                 |                                                                                     | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                   |                                                                                     | 6                                                                                   | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 | 4                                                                                 |                                                                                   | 8                                                                                 | 8                                                                                 | 5                                                                                 | 6                                                                                   | 6                                                                                   | 6                                                                                   | 5                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               | 6.0                                                                               |                                                                                   | 6.0                                                                               | 6.0                                                                               | 5.0                                                                               | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 5.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 30.0                                                                              | 30.0                                                                              |                                                                                   | 30.0                                                                              | 30.0                                                                              | 9.8                                                                               | 22.9                                                                                | 22.9                                                                                | 22.9                                                                                | 9.8                                                                                 | 28.7                                                                                |                                                                                     |
| Total Split (s)         | 30.0                                                                              | 30.0                                                                              | 0.0                                                                               | 30.0                                                                              | 30.0                                                                              | 25.4                                                                              | 44.6                                                                                | 44.6                                                                                | 44.6                                                                                | 25.4                                                                                | 70.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 30.0%                                                                             | 30.0%                                                                             | 0.0%                                                                              | 30.0%                                                                             | 30.0%                                                                             | 25.4%                                                                             | 44.6%                                                                               | 44.6%                                                                               | 44.6%                                                                               | 25.4%                                                                               | 70.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 3.0                                                                               | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 | 3.0                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 1.0                                                                               | 1.8                                                                                 | 1.8                                                                                 | 1.8                                                                                 | 1.0                                                                                 | 1.8                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 5.7                                                                                 | 5.7                                                                                 | 5.7                                                                                 | 4.0                                                                                 | 5.7                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lead                                                                              | Lag                                                                                 | Lag                                                                                 | Lag                                                                                 | Lead                                                                                |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                               | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 |                                                                                     |                                                                                     |
| Recall Mode             | None                                                                              | None                                                                              |                                                                                   | None                                                                              | None                                                                              | None                                                                              | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               | None                                                                                | C-Min                                                                               |                                                                                     |
| Act Effect Green (s)    | 15.5                                                                              | 15.5                                                                              |                                                                                   | 15.5                                                                              | 15.5                                                                              | 35.5                                                                              | 54.8                                                                                | 54.8                                                                                | 54.8                                                                                | 74.5                                                                                | 72.8                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.16                                                                              | 0.16                                                                              |                                                                                   | 0.16                                                                              | 0.16                                                                              | 0.36                                                                              | 0.55                                                                                | 0.55                                                                                | 0.55                                                                                | 0.74                                                                                | 0.73                                                                                |                                                                                     |
| v/c Ratio               | 0.63                                                                              | 0.50                                                                              |                                                                                   | 0.70                                                                              | 0.33                                                                              | 0.47                                                                              | 0.20                                                                                | 0.26                                                                                | 0.10                                                                                | 0.54                                                                                | 0.66                                                                                |                                                                                     |
| Control Delay           | 53.6                                                                              | 42.0                                                                              |                                                                                   | 60.6                                                                              | 39.3                                                                              | 6.9                                                                               | 21.3                                                                                | 14.3                                                                                | 4.4                                                                                 | 5.5                                                                                 | 5.3                                                                                 |                                                                                     |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.1                                                                                 | 0.1                                                                                 |                                                                                     |
| Total Delay             | 53.6                                                                              | 42.0                                                                              |                                                                                   | 60.6                                                                              | 39.3                                                                              | 6.9                                                                               | 21.3                                                                                | 14.3                                                                                | 4.4                                                                                 | 5.5                                                                                 | 5.5                                                                                 |                                                                                     |
| LOS                     | D                                                                                 | D                                                                                 |                                                                                   | E                                                                                 | D                                                                                 | A                                                                                 | C                                                                                   | B                                                                                   | A                                                                                   | A                                                                                   | A                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 47.2                                                                              |                                                                                   |                                                                                   | 25.8                                                                              |                                                                                   |                                                                                     | 13.2                                                                                |                                                                                     |                                                                                     | 5.5                                                                                 |                                                                                     |
| Approach LOS            |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | C                                                                                 |                                                                                   |                                                                                     | B                                                                                   |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 69                                                                                | 80                                                                                |                                                                                   | 74                                                                                | 47                                                                                | 23                                                                                | 8                                                                                   | 75                                                                                  | 0                                                                                   | 50                                                                                  | 155                                                                                 |                                                                                     |
| Queue Length 95th (ft)  | 119                                                                               | 129                                                                               |                                                                                   | 125                                                                               | 85                                                                                | 64                                                                                | 36                                                                                  | 146                                                                                 | 28                                                                                  | m82                                                                                 | 198                                                                                 |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 291                                                                               |                                                                                   |                                                                                   | 261                                                                               |                                                                                   |                                                                                    | 534                                                                                 |                                                                                     |                                                                                     | 378                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 150                                                                               |                                                                                   |                                                                                   | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 284                                                                               | 433                                                                               |                                                                                   | 265                                                                               | 390                                                                               | 679                                                                               | 136                                                                                | 1816                                                                                | 786                                                                                 | 813                                                                                 | 2543                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 30                                                                                  | 142                                                                                 |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.40                                                                              | 0.33                                                                              |                                                                                   | 0.45                                                                              | 0.21                                                                              | 0.41                                                                              | 0.20                                                                               | 0.26                                                                                | 0.10                                                                                | 0.51                                                                                | 0.70                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 95 (95%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.70

Intersection Signal Delay: 12.8

Intersection LOS: B

Intersection Capacity Utilization 81.6%

ICU Level of Service D

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Divide Ave & Bismarck Expy

|                                                                                        |                                                                                          |
|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
|  ø2  |  ø4  |
| 70 s                                                                                   | 30 s                                                                                     |
|  ø5 |  ø8 |
| 25.4 s                                                                                 | 30 s                                                                                     |
|  ø6 |                                                                                          |
| 44.6 s                                                                                 |                                                                                          |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |                                                                                   |  |                                                                                   |                                                                                   |                                                                                   |                                                                                    |  |  |  |  |  |
| Volume (vph)            | 143                                                                               | 0                                                                                 | 580                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 693                                                                                 | 101                                                                                 | 27                                                                                  | 1063                                                                                | 0                                                                                   |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                 | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 0                                                                                 |                                                                                   | 175                                                                               | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  |                                                                                     | 0                                                                                   | 222                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 1                                                                                 |                                                                                   | 1                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 300                                                                               | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                 |                                                                                     | 25                                                                                  | 150                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                    |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                    | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 575                                                                               |                                                                                   |                                                                                   | 383                                                                               |                                                                                   |                                                                                    | 458                                                                                 |                                                                                     |                                                                                     | 769                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 13.1                                                                              |                                                                                   |                                                                                   | 8.7                                                                               |                                                                                   |                                                                                    | 7.8                                                                                 |                                                                                     |                                                                                     | 13.1                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                               | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                               | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 4%                                                                                | 0%                                                                                | 3%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 0%                                                                                 | 13%                                                                                 | 29%                                                                                 | 13%                                                                                 | 2%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 155                                                                               | 0                                                                                 | 630                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 753                                                                                 | 110                                                                                 | 29                                                                                  | 1155                                                                                | 0                                                                                   |
| Turn Type               | custom                                                                            |                                                                                   | custom                                                                            |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     | Perm                                                                                | Perm                                                                                |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     | 6                                                                                   | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                   | 6                                                                                   | 2                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               |                                                                                   | 6.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 21.1                                                                              |                                                                                   | 21.1                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 23.4                                                                                | 23.4                                                                                | 21.4                                                                                | 21.4                                                                                |                                                                                     |
| Total Split (s)         | 54.0                                                                              | 0.0                                                                               | 54.0                                                                              | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 46.0                                                                                | 46.0                                                                                | 46.0                                                                                | 46.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 54.0%                                                                             | 0.0%                                                                              | 54.0%                                                                             | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                               | 46.0%                                                                               | 46.0%                                                                               | 46.0%                                                                               | 46.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.6                                                                               |                                                                                   | 3.6                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 1.5                                                                               |                                                                                   | 1.5                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 1.5                                                                                 | 1.5                                                                                 | 1.5                                                                                 | 1.5                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 5.1                                                                               | 4.0                                                                               | 5.1                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                                | 5.4                                                                                 | 5.4                                                                                 | 5.4                                                                                 | 5.4                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Recall Mode             | None                                                                              |                                                                                   | None                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               |                                                                                     |
| Act Effct Green (s)     | 44.1                                                                              |                                                                                   | 44.1                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 45.4                                                                                | 45.4                                                                                | 45.4                                                                                | 45.4                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.44                                                                              |                                                                                   | 0.44                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.45                                                                                | 0.45                                                                                | 0.45                                                                                | 0.45                                                                                |                                                                                     |
| v/c Ratio               | 0.20                                                                              |                                                                                   | 0.89                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.52                                                                                | 0.18                                                                                | 0.13                                                                                | 0.72                                                                                |                                                                                     |
| Control Delay           | 16.7                                                                              |                                                                                   | 40.8                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 19.3                                                                                | 3.6                                                                                 | 4.4                                                                                 | 8.2                                                                                 |                                                                                     |
| Queue Delay             | 0.0                                                                               |                                                                                   | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |
| Total Delay             | 16.7                                                                              |                                                                                   | 40.8                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 19.3                                                                                | 3.6                                                                                 | 4.4                                                                                 | 8.2                                                                                 |                                                                                     |
| LOS                     | B                                                                                 |                                                                                   | D                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | B                                                                                   | A                                                                                   | A                                                                                   | A                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 17.3                                                                                |                                                                                     |                                                                                     | 8.1                                                                                 |                                                                                     |
| Approach LOS            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | B                                                                                   |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 56                                                                                |                                                                                   | 333                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 205                                                                                 | 5                                                                                   | 5                                                                                   | 192                                                                                 |                                                                                     |
| Queue Length 95th (ft)  | 91                                                                                |                                                                                   | #499                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 160                                                                                 | 19                                                                                  | m5                                                                                  | m176                                                                                |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 495                                                                               |                                                                                   |                                                                                   | 303                                                                               |                                                                                   |                                                                                    | 378                                                                                 |                                                                                     |                                                                                     | 689                                                                                 |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   | 175                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | 222                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 849                                                                               |                                                                                   | 779                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 1449                                                                                | 628                                                                                 | 217                                                                                 | 1605                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.18                                                                              |                                                                                   | 0.81                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.52                                                                                | 0.18                                                                                | 0.13                                                                                | 0.72                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 86 (86%), Referenced to phase 2:SBTL and 6:NBT, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.89

Intersection Signal Delay: 18.7

Intersection LOS: B

Intersection Capacity Utilization 98.9%

ICU Level of Service F

Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: South Ramp & Centennial Rd

|                                                                                        |                                                                                        |
|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
|  ø2 |  ø4 |
| 46 s                                                                                   | 54 s                                                                                   |
|  ø6 |                                                                                        |
| 46 s                                                                                   |                                                                                        |

|                         |  |      |      |        |      |        |       |       |      |      |       |      |
|-------------------------|------------------------------------------------------------------------------------|------|------|--------|------|--------|-------|-------|------|------|-------|------|
| Lane Group              | EBL                                                                                | EBT  | EBR  | WBL    | WBT  | WBR    | NBL   | NBT   | NBR  | SBL  | SBT   | SBR  |
| Lane Configurations     |                                                                                    |      |      | ↰      |      | ↰      | ↰     | ↕     |      |      | ↕     |      |
| Volume (vph)            | 0                                                                                  | 0    | 0    | 87     | 0    | 9      | 412   | 529   | 0    | 0    | 1700  | 380  |
| Ideal Flow (vphpl)      | 1900                                                                               | 1900 | 1900 | 1900   | 1900 | 1900   | 1900  | 1900  | 1900 | 1900 | 1900  | 1900 |
| Lane Width (ft)         | 12                                                                                 | 12   | 12   | 16     | 12   | 12     | 12    | 12    | 12   | 12   | 12    | 12   |
| Grade (%)               |                                                                                    | 0%   |      |        | 0%   |        |       | 0%    |      |      | 0%    |      |
| Storage Length (ft)     | 0                                                                                  |      | 0    | 0      |      | 150    | 215   |       | 0    | 0    |       | 0    |
| Storage Lanes           | 0                                                                                  |      | 0    | 1      |      | 1      | 1     |       | 0    | 0    |       | 0    |
| Taper Length (ft)       | 25                                                                                 |      | 25   | 25     |      | 100    | 150   |       | 25   | 25   |       | 25   |
| Right Turn on Red       |                                                                                    |      | Yes  |        |      | Yes    |       |       | Yes  |      |       | Yes  |
| Link Speed (mph)        |                                                                                    | 30   |      |        | 30   |        |       | 40    |      |      | 40    |      |
| Link Distance (ft)      |                                                                                    | 270  |      |        | 465  |        |       | 769   |      |      | 779   |      |
| Travel Time (s)         |                                                                                    | 6.1  |      |        | 10.6 |        |       | 13.1  |      |      | 13.3  |      |
| Confl. Peds. (#/hr)     |                                                                                    |      |      |        |      |        |       |       |      |      |       |      |
| Confl. Bikes (#/hr)     |                                                                                    |      |      |        |      |        |       |       |      |      |       |      |
| Peak Hour Factor        | 0.92                                                                               | 0.92 | 0.92 | 0.92   | 0.92 | 0.92   | 0.92  | 0.92  | 0.92 | 0.92 | 0.92  | 0.92 |
| Growth Factor           | 100%                                                                               | 100% | 100% | 100%   | 100% | 100%   | 100%  | 100%  | 100% | 100% | 100%  | 100% |
| Heavy Vehicles (%)      | 2%                                                                                 | 2%   | 2%   | 10%    | 2%   | 33%    | 7%    | 4%    | 2%   | 2%   | 1%    | 1%   |
| Bus Blockages (#/hr)    | 0                                                                                  | 0    | 0    | 0      | 0    | 0      | 0     | 0     | 0    | 0    | 0     | 0    |
| Parking (#/hr)          |                                                                                    |      |      |        |      |        |       |       |      |      |       |      |
| Mid-Block Traffic (%)   |                                                                                    | 0%   |      |        | 0%   |        |       | 0%    |      |      | 0%    |      |
| Shared Lane Traffic (%) |                                                                                    |      |      |        |      |        |       |       |      |      |       |      |
| Lane Group Flow (vph)   | 0                                                                                  | 0    | 0    | 95     | 0    | 10     | 448   | 575   | 0    | 0    | 2261  | 0    |
| Turn Type               |                                                                                    |      |      | custom |      | custom | pm+pt |       |      |      |       |      |
| Protected Phases        |                                                                                    |      |      |        |      |        | 1     | 6     |      |      | 2     |      |
| Permitted Phases        |                                                                                    |      |      | 8      |      | 8      | 6     |       |      |      |       |      |
| Detector Phase          |                                                                                    |      |      | 8      |      | 8      | 1     | 6     |      |      | 2     |      |
| Switch Phase            |                                                                                    |      |      |        |      |        |       |       |      |      |       |      |
| Minimum Initial (s)     |                                                                                    |      |      | 5.0    |      | 5.0    | 5.0   | 10.0  |      |      | 10.0  |      |
| Minimum Split (s)       |                                                                                    |      |      | 20.0   |      | 20.0   | 9.0   | 20.0  |      |      | 22.4  |      |
| Total Split (s)         | 0.0                                                                                | 0.0  | 0.0  | 20.0   | 0.0  | 20.0   | 21.0  | 80.0  | 0.0  | 0.0  | 59.0  | 0.0  |
| Total Split (%)         | 0.0%                                                                               | 0.0% | 0.0% | 20.0%  | 0.0% | 20.0%  | 21.0% | 80.0% | 0.0% | 0.0% | 59.0% | 0.0% |
| Yellow Time (s)         |                                                                                    |      |      | 3.2    |      | 3.2    | 3.0   | 3.9   |      |      | 3.9   |      |
| All-Red Time (s)        |                                                                                    |      |      | 2.0    |      | 2.0    | 1.0   | 1.5   |      |      | 1.5   |      |
| Lost Time Adjust (s)    | 0.0                                                                                | 0.0  | 0.0  | 0.0    | 0.0  | 0.0    | 0.0   | 0.0   | 0.0  | 0.0  | 0.0   | 0.0  |
| Total Lost Time (s)     | 4.0                                                                                | 4.0  | 4.0  | 5.2    | 4.0  | 5.2    | 4.0   | 5.4   | 4.0  | 4.0  | 5.4   | 4.0  |
| Lead/Lag                |                                                                                    |      |      |        |      |        | Lag   |       |      |      | Lead  |      |
| Lead-Lag Optimize?      |                                                                                    |      |      |        |      |        | Yes   |       |      |      | Yes   |      |
| Recall Mode             |                                                                                    |      |      | None   |      | None   | None  | C-Min |      |      | C-Min |      |
| Act Effect Green (s)    |                                                                                    |      |      | 9.5    |      | 9.5    | 83.5  | 83.2  |      |      | 61.1  |      |
| Actuated g/C Ratio      |                                                                                    |      |      | 0.10   |      | 0.10   | 0.84  | 0.83  |      |      | 0.61  |      |
| v/c Ratio               |                                                                                    |      |      | 0.54   |      | 0.08   | 1.25  | 0.20  |      |      | 1.06  |      |
| Control Delay           |                                                                                    |      |      | 53.9   |      | 21.9   | 157.1 | 1.6   |      |      | 40.4  |      |
| Queue Delay             |                                                                                    |      |      | 0.0    |      | 0.0    | 0.0   | 0.0   |      |      | 0.0   |      |
| Total Delay             |                                                                                    |      |      | 53.9   |      | 21.9   | 157.1 | 1.6   |      |      | 40.4  |      |
| LOS                     |                                                                                    |      |      | D      |      | C      | F     | A     |      |      | D     |      |
| Approach Delay          |                                                                                    |      |      |        |      |        |       | 69.7  |      |      | 40.4  |      |
| Approach LOS            |                                                                                    |      |      |        |      |        |       | E     |      |      | D     |      |
| Queue Length 50th (ft)  |                                                                                    |      |      | 59     |      | 0      | ~318  | 28    |      |      | ~837  |      |
| Queue Length 95th (ft)  |                                                                                    |      |      | 106    |      | 15     | #539  | 38    |      |      | m297  |      |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 190                                                                               |                                                                                   |                                                                                   | 385                                                                               |                                                                                   |                                                                                    | 689                                                                                 |                                                                                     |                                                                                     | 699                                                                                 |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 150                                                                               | 215                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Base Capacity (vph)     |                                                                                   |                                                                                   |                                                                                   | 275                                                                               |                                                                                   | 188                                                                               | 359                                                                                | 2886                                                                                |                                                                                     |                                                                                     | 2140                                                                                |                                                                                     |
| Starvation Cap Reductn  |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     |                                                                                     | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     |                                                                                     | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     |                                                                                     | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       |                                                                                   |                                                                                   |                                                                                   | 0.35                                                                              |                                                                                   | 0.05                                                                              | 1.25                                                                               | 0.20                                                                                |                                                                                     |                                                                                     | 1.06                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 60 (60%), Referenced to phase 2:SBT and 6:NBTL, Start of Green

Natural Cycle: 150

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.25

Intersection Signal Delay: 49.5

Intersection LOS: D

Intersection Capacity Utilization 98.9%

ICU Level of Service F

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: North Ramp & Centennial Rd



|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |                                                                                   |  |  |                                                                                   |  |  |  |  |                                                                                     |  |  |                                                                                     |
| Volume (veh/h)                    | 10                                                                                | 2                                                                                 | 290                                                                               | 122                                                                               | 6                                                                                 | 54                                                                                | 101                                                                                 | 467                                                                                 | 110                                                                                 | 27                                                                                  | 1644                                                                                | 27                                                                                  |
| Sign Control                      |                                                                                   | Stop                                                                              |                                                                                   |                                                                                   | Stop                                                                              |                                                                                   |                                                                                     | Free                                                                                |                                                                                     |                                                                                     | Free                                                                                |                                                                                     |
| Grade                             |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Peak Hour Factor                  | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Hourly flow rate (vph)            | 11                                                                                | 2                                                                                 | 315                                                                               | 133                                                                               | 7                                                                                 | 59                                                                                | 110                                                                                 | 508                                                                                 | 120                                                                                 | 29                                                                                  | 1787                                                                                | 29                                                                                  |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Width (ft)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Walking Speed (ft/s)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Right turn flare (veh)            |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Median type                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     | None                                                                                |                                                                                     |                                                                                     | None                                                                                |                                                                                     |
| Median storage veh)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Upstream signal (ft)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 779                                                                                 |                                                                                     |                                                                                     | 1310                                                                                |                                                                                     |
| pX, platoon unblocked             | 0.75                                                                              | 0.75                                                                              | 0.75                                                                              | 0.75                                                                              | 0.75                                                                              |                                                                                   | 0.75                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC, conflicting volume            | 2337                                                                              | 2707                                                                              | 908                                                                               | 1740                                                                              | 2662                                                                              | 314                                                                               | 1816                                                                                |                                                                                     |                                                                                     | 627                                                                                 |                                                                                     |                                                                                     |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vCu, unblocked vol                | 2119                                                                              | 2611                                                                              | 221                                                                               | 1326                                                                              | 2551                                                                              | 314                                                                               | 1427                                                                                |                                                                                     |                                                                                     | 627                                                                                 |                                                                                     |                                                                                     |
| tC, single (s)                    | 7.8                                                                               | 6.5                                                                               | 6.9                                                                               | *7.5                                                                              | 6.5                                                                               | 6.9                                                                               | 4.3                                                                                 |                                                                                     |                                                                                     | 4.3                                                                                 |                                                                                     |                                                                                     |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| tF (s)                            | 3.7                                                                               | 4.0                                                                               | 3.3                                                                               | 3.5                                                                               | 4.0                                                                               | 3.3                                                                               | 2.3                                                                                 |                                                                                     |                                                                                     | 2.3                                                                                 |                                                                                     |                                                                                     |
| p0 queue free %                   | 0                                                                                 | 82                                                                                | 47                                                                                | 0                                                                                 | 50                                                                                | 91                                                                                | 66                                                                                  |                                                                                     |                                                                                     | 97                                                                                  |                                                                                     |                                                                                     |
| cM capacity (veh/h)               | 7                                                                                 | 12                                                                                | 592                                                                               | 25                                                                                | 13                                                                                | 688                                                                               | 326                                                                                 |                                                                                     |                                                                                     | 886                                                                                 |                                                                                     |                                                                                     |
| Direction, Lane #                 | EB 1                                                                              | WB 1                                                                              | NB 1                                                                              | NB 2                                                                              | NB 3                                                                              | SB 1                                                                              | SB 2                                                                                | SB 3                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Total                      | 328                                                                               | 198                                                                               | 110                                                                               | 338                                                                               | 289                                                                               | 29                                                                                | 1191                                                                                | 625                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Left                       | 11                                                                                | 133                                                                               | 110                                                                               | 0                                                                                 | 0                                                                                 | 29                                                                                | 0                                                                                   | 0                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Right                      | 315                                                                               | 59                                                                                | 0                                                                                 | 0                                                                                 | 120                                                                               | 0                                                                                 | 0                                                                                   | 29                                                                                  |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| cSH                               | 205                                                                               | 34                                                                                | 326                                                                               | 1700                                                                              | 1700                                                                              | 886                                                                               | 1700                                                                                | 1700                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume to Capacity                | 1.60                                                                              | 5.78                                                                              | 0.34                                                                              | 0.20                                                                              | 0.17                                                                              | 0.03                                                                              | 0.70                                                                                | 0.37                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Queue Length 95th (ft)            | 530                                                                               | Err                                                                               | 36                                                                                | 0                                                                                 | 0                                                                                 | 3                                                                                 | 0                                                                                   | 0                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Control Delay (s)                 | 63.2                                                                              | Err                                                                               | 21.5                                                                              | 0.0                                                                               | 0.0                                                                               | 9.2                                                                               | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane LOS                          | F                                                                                 | F                                                                                 | C                                                                                 |                                                                                   |                                                                                   | A                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach Delay (s)                | 63.2                                                                              | Err                                                                               | 3.2                                                                               |                                                                                   |                                                                                   | 0.1                                                                               |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach LOS                      | F                                                                                 | F                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Average Delay                     |                                                                                   |                                                                                   | 643.8                                                                             |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 81.3%                                                                             |                                                                                   | ICU Level of Service                                                              |                                                                                   |                                                                                     |                                                                                     | D                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

\* User Entered Value

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |                                                                                   |  |  |                                                                                   |  |  |                                                                                     |  |  |  |
| Volume (vph)            | 25                                                                                | 34                                                                                | 220                                                                               | 909                                                                               | 376                                                                               | 49                                                                                | 148                                                                                | 324                                                                                 | 31                                                                                  | 32                                                                                  | 1370                                                                                | 123                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                 | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 215                                                                               |                                                                                   | 0                                                                                 | 215                                                                               |                                                                                   | 0                                                                                 | 215                                                                                |                                                                                     | 0                                                                                   | 215                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                  |                                                                                     | 0                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                 |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                    |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 35                                                                                |                                                                                   |                                                                                   | 35                                                                                |                                                                                   |                                                                                    | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 596                                                                               |                                                                                   |                                                                                   | 559                                                                               |                                                                                   |                                                                                    | 1310                                                                                |                                                                                     |                                                                                     | 507                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 11.6                                                                              |                                                                                   |                                                                                   | 10.9                                                                              |                                                                                   |                                                                                    | 22.3                                                                                |                                                                                     |                                                                                     | 8.6                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                               | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                               | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 0%                                                                                | 0%                                                                                | 0%                                                                                | 0%                                                                                | 1%                                                                                | 3%                                                                                | 5%                                                                                 | 5%                                                                                  | 0%                                                                                  | 0%                                                                                  | 2%                                                                                  | 3%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 27                                                                                | 276                                                                               | 0                                                                                 | 988                                                                               | 462                                                                               | 0                                                                                 | 161                                                                                | 386                                                                                 | 0                                                                                   | 35                                                                                  | 1623                                                                                | 0                                                                                   |
| Turn Type               | pm+pt                                                                             |                                                                                   |                                                                                   | pm+pt                                                                             |                                                                                   |                                                                                   | pm+pt                                                                              |                                                                                     |                                                                                     | pm+pt                                                                               |                                                                                     |                                                                                     |
| Protected Phases        | 7                                                                                 | 4                                                                                 |                                                                                   | 3                                                                                 | 8                                                                                 |                                                                                   | 1                                                                                  | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   |                                                                                   | 6                                                                                  |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 7                                                                                 | 4                                                                                 |                                                                                   | 3                                                                                 | 8                                                                                 |                                                                                   | 1                                                                                  | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 4.0                                                                               | 10.0                                                                              |                                                                                   | 4.0                                                                               | 10.0                                                                              |                                                                                   | 4.0                                                                                | 6.0                                                                                 |                                                                                     | 4.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 8.0                                                                               | 15.7                                                                              |                                                                                   | 8.0                                                                               | 15.7                                                                              |                                                                                   | 8.0                                                                                | 11.5                                                                                |                                                                                     | 8.0                                                                                 | 11.5                                                                                |                                                                                     |
| Total Split (s)         | 12.0                                                                              | 16.0                                                                              | 0.0                                                                               | 36.0                                                                              | 40.0                                                                              | 0.0                                                                               | 12.0                                                                               | 36.0                                                                                | 0.0                                                                                 | 12.0                                                                                | 36.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 12.0%                                                                             | 16.0%                                                                             | 0.0%                                                                              | 36.0%                                                                             | 40.0%                                                                             | 0.0%                                                                              | 12.0%                                                                              | 36.0%                                                                               | 0.0%                                                                                | 12.0%                                                                               | 36.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.5                                                                               | 3.9                                                                               |                                                                                   | 3.5                                                                               | 3.9                                                                               |                                                                                   | 3.5                                                                                | 3.6                                                                                 |                                                                                     | 3.5                                                                                 | 3.6                                                                                 |                                                                                     |
| All-Red Time (s)        | 0.5                                                                               | 1.8                                                                               |                                                                                   | 0.5                                                                               | 1.8                                                                               |                                                                                   | 0.5                                                                                | 1.9                                                                                 |                                                                                     | 0.5                                                                                 | 1.9                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 5.7                                                                               | 4.0                                                                               | 4.0                                                                               | 5.7                                                                               | 4.0                                                                               | 4.0                                                                                | 5.5                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 5.5                                                                                 | 4.0                                                                                 |
| Lead/Lag                | Lead                                                                              | Lag                                                                               |                                                                                   | Lead                                                                              | Lag                                                                               |                                                                                   | Lag                                                                                | Lead                                                                                |                                                                                     | Lag                                                                                 | Lead                                                                                |                                                                                     |
| Lead-Lag Optimize?      | Yes                                                                               | Yes                                                                               |                                                                                   | Yes                                                                               | Yes                                                                               |                                                                                   | Yes                                                                                | Yes                                                                                 |                                                                                     | Yes                                                                                 | Yes                                                                                 |                                                                                     |
| Recall Mode             | None                                                                              | Max                                                                               |                                                                                   | None                                                                              | Max                                                                               |                                                                                   | None                                                                               | C-Max                                                                               |                                                                                     | None                                                                                | C-Max                                                                               |                                                                                     |
| Act Effect Green (s)    | 18.3                                                                              | 10.3                                                                              |                                                                                   | 48.4                                                                              | 40.2                                                                              |                                                                                   | 41.2                                                                               | 34.9                                                                                |                                                                                     | 39.0                                                                                | 30.5                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.18                                                                              | 0.10                                                                              |                                                                                   | 0.48                                                                              | 0.40                                                                              |                                                                                   | 0.41                                                                               | 0.35                                                                                |                                                                                     | 0.39                                                                                | 0.30                                                                                |                                                                                     |
| v/c Ratio               | 0.12                                                                              | 0.92                                                                              |                                                                                   | 1.49                                                                              | 0.62                                                                              |                                                                                   | 0.78                                                                               | 0.32                                                                                |                                                                                     | 0.09                                                                                | 1.51                                                                                |                                                                                     |
| Control Delay           | 19.4                                                                              | 58.5                                                                              |                                                                                   | 254.2                                                                             | 29.4                                                                              |                                                                                   | 61.6                                                                               | 20.5                                                                                |                                                                                     | 17.4                                                                                | 264.0                                                                               |                                                                                     |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                                | 0.0                                                                                 |                                                                                     | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |
| Total Delay             | 19.4                                                                              | 58.5                                                                              |                                                                                   | 254.2                                                                             | 29.4                                                                              |                                                                                   | 61.6                                                                               | 20.5                                                                                |                                                                                     | 17.4                                                                                | 264.0                                                                               |                                                                                     |
| LOS                     | B                                                                                 | E                                                                                 |                                                                                   | F                                                                                 | C                                                                                 |                                                                                   | E                                                                                  | C                                                                                   |                                                                                     | B                                                                                   | F                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 55.0                                                                              |                                                                                   |                                                                                   | 182.6                                                                             |                                                                                   |                                                                                    | 32.6                                                                                |                                                                                     |                                                                                     | 258.8                                                                               |                                                                                     |
| Approach LOS            |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | F                                                                                 |                                                                                   |                                                                                    | C                                                                                   |                                                                                     |                                                                                     | F                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 9                                                                                 | 86                                                                                |                                                                                   | ~838                                                                              | 244                                                                               |                                                                                   | 74                                                                                 | 112                                                                                 |                                                                                     | 12                                                                                  | ~768                                                                                |                                                                                     |
| Queue Length 95th (ft)  | 23                                                                                | #243                                                                              |                                                                                   | #1083                                                                             | 367                                                                               |                                                                                   | #164                                                                               | 132                                                                                 |                                                                                     | 31                                                                                  | #908                                                                                |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 516                                                                               |                                                                                   |                                                                                   | 479                                                                               |                                                                                   |                                                                                    | 1230                                                                                |                                                                                     |                                                                                     | 427                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 215                                                                               |                                                                                   |                                                                                   | 215                                                                               |                                                                                   |                                                                                   | 215                                                                                |                                                                                     |                                                                                     | 215                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 258                                                                               | 299                                                                               |                                                                                   | 662                                                                               | 747                                                                               |                                                                                   | 214                                                                                | 1195                                                                                |                                                                                     | 425                                                                                 | 1073                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.10                                                                              | 0.92                                                                              |                                                                                   | 1.49                                                                              | 0.62                                                                              |                                                                                   | 0.75                                                                               | 0.32                                                                                |                                                                                     | 0.08                                                                                | 1.51                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 48 (48%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 140

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.51

Intersection Signal Delay: 184.0

Intersection LOS: F

Intersection Capacity Utilization 131.7%

ICU Level of Service H

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 5: Century Ave & Centennial Rd

|                                                                                        |                                                                                        |                                                                                        |                                                                                          |
|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
|  ø2 |  ø1 |  ø3 |  ø4 |
| 36 s                                                                                   | 12 s                                                                                   | 36 s                                                                                   | 16 s                                                                                     |
|  ø6 |  ø5 |  ø7 |  ø8   |
| 36 s                                                                                   | 12 s                                                                                   | 12 s                                                                                   | 40 s                                                                                     |

## **Appendix K: 2024 - Existing Control PM (2A2)**

Exit 161 Operational Study  
Bismarck, ND

1: Divide Ave & Bismarck Expy

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |                                                                                   |  |  |  |  |  |  |  |  |  |
| Volume (vph)            | 268                                                                               | 52                                                                                | 23                                                                                | 88                                                                                | 72                                                                                | 322                                                                               | 24                                                                                  | 854                                                                                 | 60                                                                                  | 233                                                                                 | 993                                                                                 | 150                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 150                                                                               |                                                                                   | 0                                                                                 | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                 |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                   |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 100                                                                               |                                                                                   | 25                                                                                | 100                                                                               |                                                                                   | 100                                                                               | 100                                                                                 |                                                                                     | 150                                                                                 | 100                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 25                                                                                |                                                                                   |                                                                                   | 25                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 371                                                                               |                                                                                   |                                                                                   | 341                                                                               |                                                                                   |                                                                                     | 614                                                                                 |                                                                                     |                                                                                     | 458                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 10.1                                                                              |                                                                                   |                                                                                   | 9.3                                                                               |                                                                                   |                                                                                     | 10.5                                                                                |                                                                                     |                                                                                     | 7.8                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 4%                                                                                | 1%                                                                                | 1%                                                                                | 11%                                                                               | 10%                                                                               | 22%                                                                               | 10%                                                                                 | 7%                                                                                  | 17%                                                                                 | 11%                                                                                 | 4%                                                                                  | 4%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 291                                                                               | 82                                                                                | 0                                                                                 | 96                                                                                | 78                                                                                | 350                                                                               | 26                                                                                  | 928                                                                                 | 65                                                                                  | 253                                                                                 | 1242                                                                                | 0                                                                                   |
| Turn Type               | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                              |                                                                                   | pm+ov                                                                             | Perm                                                                                |                                                                                     | Perm                                                                                | pm+pt                                                                               |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 | 5                                                                                 |                                                                                     | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                   |                                                                                     | 6                                                                                   | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 | 4                                                                                 |                                                                                   | 8                                                                                 | 8                                                                                 | 5                                                                                 | 6                                                                                   | 6                                                                                   | 6                                                                                   | 5                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               | 6.0                                                                               |                                                                                   | 6.0                                                                               | 6.0                                                                               | 5.0                                                                               | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 5.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 30.0                                                                              | 30.0                                                                              |                                                                                   | 30.0                                                                              | 30.0                                                                              | 9.8                                                                               | 22.9                                                                                | 22.9                                                                                | 22.9                                                                                | 9.8                                                                                 | 28.7                                                                                |                                                                                     |
| Total Split (s)         | 37.0                                                                              | 37.0                                                                              | 0.0                                                                               | 37.0                                                                              | 37.0                                                                              | 21.0                                                                              | 42.0                                                                                | 42.0                                                                                | 42.0                                                                                | 21.0                                                                                | 63.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 37.0%                                                                             | 37.0%                                                                             | 0.0%                                                                              | 37.0%                                                                             | 37.0%                                                                             | 21.0%                                                                             | 42.0%                                                                               | 42.0%                                                                               | 42.0%                                                                               | 21.0%                                                                               | 63.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 3.0                                                                               | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 | 3.0                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 1.0                                                                               | 1.8                                                                                 | 1.8                                                                                 | 1.8                                                                                 | 1.0                                                                                 | 1.8                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 5.7                                                                                 | 5.7                                                                                 | 5.7                                                                                 | 4.0                                                                                 | 5.7                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lead                                                                              | Lag                                                                                 | Lag                                                                                 | Lag                                                                                 | Lead                                                                                |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                               | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 |                                                                                     |                                                                                     |
| Recall Mode             | None                                                                              | None                                                                              |                                                                                   | None                                                                              | None                                                                              | None                                                                              | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               | None                                                                                | C-Min                                                                               |                                                                                     |
| Act Effct Green (s)     | 26.5                                                                              | 26.5                                                                              |                                                                                   | 26.5                                                                              | 26.5                                                                              | 45.5                                                                              | 44.8                                                                                | 44.8                                                                                | 44.8                                                                                | 63.5                                                                                | 61.8                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.26                                                                              | 0.26                                                                              |                                                                                   | 0.26                                                                              | 0.26                                                                              | 0.46                                                                              | 0.45                                                                                | 0.45                                                                                | 0.45                                                                                | 0.64                                                                                | 0.62                                                                                |                                                                                     |
| v/c Ratio               | 0.85                                                                              | 0.17                                                                              |                                                                                   | 0.30                                                                              | 0.17                                                                              | 0.56                                                                              | 0.15                                                                                | 0.61                                                                                | 0.10                                                                                | 0.67                                                                                | 0.59                                                                                |                                                                                     |
| Control Delay           | 57.3                                                                              | 20.2                                                                              |                                                                                   | 30.5                                                                              | 27.5                                                                              | 20.3                                                                              | 23.6                                                                                | 25.1                                                                                | 6.0                                                                                 | 22.9                                                                                | 7.3                                                                                 |                                                                                     |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.3                                                                                 |                                                                                     |
| Total Delay             | 57.3                                                                              | 20.2                                                                              |                                                                                   | 30.5                                                                              | 27.5                                                                              | 20.3                                                                              | 23.6                                                                                | 25.2                                                                                | 6.0                                                                                 | 22.9                                                                                | 7.6                                                                                 |                                                                                     |
| LOS                     | E                                                                                 | C                                                                                 |                                                                                   | C                                                                                 | C                                                                                 | C                                                                                 | C                                                                                   | C                                                                                   | A                                                                                   | C                                                                                   | A                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 49.2                                                                              |                                                                                   |                                                                                   | 23.3                                                                              |                                                                                   |                                                                                     | 23.9                                                                                |                                                                                     |                                                                                     | 10.1                                                                                |                                                                                     |
| Approach LOS            |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | C                                                                                 |                                                                                   |                                                                                     | C                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 172                                                                               | 28                                                                                |                                                                                   | 48                                                                                | 37                                                                                | 137                                                                               | 10                                                                                  | 237                                                                                 | 0                                                                                   | 55                                                                                  | 150                                                                                 |                                                                                     |
| Queue Length 95th (ft)  | #284                                                                              | 62                                                                                |                                                                                   | 89                                                                                | 71                                                                                | 193                                                                               | 33                                                                                  | 346                                                                                 | 28                                                                                  | 152                                                                                 | 190                                                                                 |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) | 291                                                                               |                                                                                   |                                                                                   | 261                                                                               |                                                                                   |                                                                                   | 534                                                                                |                                                                                     |                                                                                     | 378                                                                                 |                                                                                     |                                                                                     |
| Turn Bay Length (ft)    | 150                                                                               |                                                                                   |                                                                                   | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 400                                                                               | 572                                                                               |                                                                                   | 374                                                                               | 535                                                                               | 673                                                                               | 174                                                                                | 1511                                                                                | 654                                                                                 | 427                                                                                 | 2114                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 286                                                                                 |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 23                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.73                                                                              | 0.14                                                                              |                                                                                   | 0.26                                                                              | 0.15                                                                              | 0.52                                                                              | 0.15                                                                               | 0.62                                                                                | 0.10                                                                                | 0.59                                                                                | 0.68                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 12 (12%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.85

Intersection Signal Delay: 20.5

Intersection LOS: C

Intersection Capacity Utilization 73.2%

ICU Level of Service D

Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 1: Divide Ave & Bismarck Expy



|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |                                                                                   |  |                                                                                   |                                                                                   |                                                                                   |                                                                                    |  |  |  |  |  |
| Volume (vph)            | 318                                                                               | 0                                                                                 | 426                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 1394                                                                                | 136                                                                                 | 32                                                                                  | 654                                                                                 | 0                                                                                   |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                 | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 0                                                                                 |                                                                                   | 175                                                                               | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  |                                                                                     | 0                                                                                   | 222                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 1                                                                                 |                                                                                   | 1                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 300                                                                               | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                 |                                                                                     | 25                                                                                  | 150                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                    |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                    | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 575                                                                               |                                                                                   |                                                                                   | 383                                                                               |                                                                                   |                                                                                    | 458                                                                                 |                                                                                     |                                                                                     | 769                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 13.1                                                                              |                                                                                   |                                                                                   | 8.7                                                                               |                                                                                   |                                                                                    | 7.8                                                                                 |                                                                                     |                                                                                     | 13.1                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                               | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                               | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 3%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                 | 8%                                                                                  | 27%                                                                                 | 10%                                                                                 | 9%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 346                                                                               | 0                                                                                 | 463                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 1515                                                                                | 148                                                                                 | 35                                                                                  | 711                                                                                 | 0                                                                                   |
| Turn Type               | custom                                                                            |                                                                                   | custom                                                                            |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     | Perm                                                                                | Perm                                                                                |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     | 6                                                                                   | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                   | 6                                                                                   | 2                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               |                                                                                   | 6.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 21.1                                                                              |                                                                                   | 21.1                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 23.4                                                                                | 23.4                                                                                | 21.4                                                                                | 21.4                                                                                |                                                                                     |
| Total Split (s)         | 40.0                                                                              | 0.0                                                                               | 40.0                                                                              | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 60.0                                                                                | 60.0                                                                                | 60.0                                                                                | 60.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 40.0%                                                                             | 0.0%                                                                              | 40.0%                                                                             | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                               | 60.0%                                                                               | 60.0%                                                                               | 60.0%                                                                               | 60.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.6                                                                               |                                                                                   | 3.6                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 1.5                                                                               |                                                                                   | 1.5                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 1.5                                                                                 | 1.5                                                                                 | 1.5                                                                                 | 1.5                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 5.1                                                                               | 4.0                                                                               | 5.1                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                                | 5.4                                                                                 | 5.4                                                                                 | 5.4                                                                                 | 5.4                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Recall Mode             | None                                                                              |                                                                                   | None                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               |                                                                                     |
| Act Effct Green (s)     | 26.0                                                                              |                                                                                   | 26.0                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 63.5                                                                                | 63.5                                                                                | 63.5                                                                                | 63.5                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.26                                                                              |                                                                                   | 0.26                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.64                                                                                | 0.64                                                                                | 0.64                                                                                | 0.64                                                                                |                                                                                     |
| v/c Ratio               | 0.76                                                                              |                                                                                   | 0.83                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.71                                                                                | 0.17                                                                                | 0.30                                                                                | 0.34                                                                                |                                                                                     |
| Control Delay           | 44.5                                                                              |                                                                                   | 32.3                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 13.1                                                                                | 3.0                                                                                 | 9.0                                                                                 | 2.8                                                                                 |                                                                                     |
| Queue Delay             | 0.0                                                                               |                                                                                   | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.1                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |
| Total Delay             | 44.5                                                                              |                                                                                   | 32.3                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 13.2                                                                                | 3.0                                                                                 | 9.0                                                                                 | 2.8                                                                                 |                                                                                     |
| LOS                     | D                                                                                 |                                                                                   | C                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | B                                                                                   | A                                                                                   | A                                                                                   | A                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 12.3                                                                                |                                                                                     |                                                                                     | 3.1                                                                                 |                                                                                     |
| Approach LOS            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | B                                                                                   |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 204                                                                               |                                                                                   | 165                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 218                                                                                 | 10                                                                                  | 1                                                                                   | 17                                                                                  |                                                                                     |
| Queue Length 95th (ft)  | 269                                                                               |                                                                                   | 260                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 260                                                                                 | m24                                                                                 | m6                                                                                  | 43                                                                                  |                                                                                     |

|                                                                      |  |  |  |  |  |  |  |  |  |  |  |  |
|----------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group                                                           | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft)                                              | 495                                                                               |                                                                                   |                                                                                   |                                                                                   | 303                                                                               |                                                                                   |                                                                                    |                                                                                     | 378                                                                                 |                                                                                     | 689                                                                                 |                                                                                     |
| Turn Bay Length (ft)                                                 |                                                                                   |                                                                                   | 175                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     | 222                                                                                 |                                                                                     |
| Base Capacity (vph)                                                  | 611                                                                               | 681                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 2124                                                                                | 862                                                                                 | 117                                                                                 | 2104                                                                                |                                                                                     |
| Starvation Cap Reductn                                               | 0                                                                                 | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 51                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn                                                | 0                                                                                 | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn                                                  | 0                                                                                 | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio                                                    | 0.57                                                                              | 0.68                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.73                                                                                | 0.17                                                                                | 0.30                                                                                | 0.34                                                                                |                                                                                     |
| Intersection Summary                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Area Type:                                                           | Other                                                                             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Cycle Length: 100                                                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Cycle Length: 100                                           |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Offset: 1 (1%), Referenced to phase 2:SBTL and 6:NBT, Start of Green |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Natural Cycle: 60                                                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Control Type: Actuated-Coordinated                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Maximum v/c Ratio: 0.83                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Signal Delay: 16.5                                      |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Intersection LOS: B                                                               |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization 74.4%                              |                                                                                   |                                                                                   |                                                                                   |                                                                                   | ICU Level of Service D                                                            |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min) 15                                             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| m Volume for 95th percentile queue is metered by upstream signal.    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

Splits and Phases: 2: South Ramp & Centennial Rd

|                                                                                        |                                                                                       |
|----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|  ø2  |  ø4 |
| 60 s                                                                                   | 40 s                                                                                  |
|  ø6 |                                                                                       |
| 60 s                                                                                   |                                                                                       |

|                         |  |      |      |                                                                                   |      |                                                                                     |                                                                                     |                                                                                     |      |      |                                                                                     |      |
|-------------------------|------------------------------------------------------------------------------------|------|------|-----------------------------------------------------------------------------------|------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------|------|-------------------------------------------------------------------------------------|------|
| Lane Group              | EBL                                                                                | EBT  | EBR  | WBL                                                                               | WBT  | WBR                                                                                 | NBL                                                                                 | NBT                                                                                 | NBR  | SBL  | SBT                                                                                 | SBR  |
| Lane Configurations     |                                                                                    |      |      |  |      |  |  |  |      |      |  |      |
| Volume (vph)            | 0                                                                                  | 0    | 0    | 95                                                                                | 0    | 20                                                                                  | 462                                                                                 | 1313                                                                                | 0    | 0    | 670                                                                                 | 186  |
| Ideal Flow (vphpl)      | 1900                                                                               | 1900 | 1900 | 1900                                                                              | 1900 | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900 | 1900 | 1900                                                                                | 1900 |
| Lane Width (ft)         | 12                                                                                 | 12   | 12   | 16                                                                                | 12   | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12   | 12   | 12                                                                                  | 12   |
| Grade (%)               |                                                                                    | 0%   |      |                                                                                   | 0%   |                                                                                     |                                                                                     | 0%                                                                                  |      |      | 0%                                                                                  |      |
| Storage Length (ft)     | 0                                                                                  |      | 0    | 0                                                                                 |      | 150                                                                                 | 215                                                                                 |                                                                                     | 0    | 0    |                                                                                     | 0    |
| Storage Lanes           | 0                                                                                  |      | 0    | 1                                                                                 |      | 1                                                                                   | 1                                                                                   |                                                                                     | 0    | 0    |                                                                                     | 0    |
| Taper Length (ft)       | 25                                                                                 |      | 25   | 25                                                                                |      | 100                                                                                 | 150                                                                                 |                                                                                     | 25   | 25   |                                                                                     | 25   |
| Right Turn on Red       |                                                                                    |      | Yes  |                                                                                   |      | Yes                                                                                 |                                                                                     |                                                                                     | Yes  |      |                                                                                     | Yes  |
| Link Speed (mph)        |                                                                                    | 30   |      |                                                                                   | 30   |                                                                                     |                                                                                     | 40                                                                                  |      |      | 40                                                                                  |      |
| Link Distance (ft)      |                                                                                    | 270  |      |                                                                                   | 465  |                                                                                     |                                                                                     | 769                                                                                 |      |      | 781                                                                                 |      |
| Travel Time (s)         |                                                                                    | 6.1  |      |                                                                                   | 10.6 |                                                                                     |                                                                                     | 13.1                                                                                |      |      | 13.3                                                                                |      |
| Confl. Peds. (#/hr)     |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     |                                                                                     |      |      |                                                                                     |      |
| Confl. Bikes (#/hr)     |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     |                                                                                     |      |      |                                                                                     |      |
| Peak Hour Factor        | 0.92                                                                               | 0.92 | 0.92 | 0.92                                                                              | 0.92 | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92 | 0.92 | 0.92                                                                                | 0.92 |
| Growth Factor           | 100%                                                                               | 100% | 100% | 100%                                                                              | 100% | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100% | 100% | 100%                                                                                | 100% |
| Heavy Vehicles (%)      | 2%                                                                                 | 2%   | 2%   | 12%                                                                               | 2%   | 8%                                                                                  | 6%                                                                                  | 3%                                                                                  | 2%   | 2%   | 3%                                                                                  | 1%   |
| Bus Blockages (#/hr)    | 0                                                                                  | 0    | 0    | 0                                                                                 | 0    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0    | 0    | 0                                                                                   | 0    |
| Parking (#/hr)          |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     |                                                                                     |      |      |                                                                                     |      |
| Mid-Block Traffic (%)   |                                                                                    | 0%   |      |                                                                                   | 0%   |                                                                                     |                                                                                     | 0%                                                                                  |      |      | 0%                                                                                  |      |
| Shared Lane Traffic (%) |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     |                                                                                     |      |      |                                                                                     |      |
| Lane Group Flow (vph)   | 0                                                                                  | 0    | 0    | 103                                                                               | 0    | 22                                                                                  | 502                                                                                 | 1427                                                                                | 0    | 0    | 930                                                                                 | 0    |
| Turn Type               |                                                                                    |      |      | custom                                                                            |      | custom                                                                              | pm+pt                                                                               |                                                                                     |      |      |                                                                                     |      |
| Protected Phases        |                                                                                    |      |      |                                                                                   |      |                                                                                     | 1                                                                                   | 6                                                                                   |      |      | 2                                                                                   |      |
| Permitted Phases        |                                                                                    |      |      | 8                                                                                 |      | 8                                                                                   | 6                                                                                   |                                                                                     |      |      |                                                                                     |      |
| Detector Phase          |                                                                                    |      |      | 8                                                                                 |      | 8                                                                                   | 1                                                                                   | 6                                                                                   |      |      | 2                                                                                   |      |
| Switch Phase            |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     |                                                                                     |      |      |                                                                                     |      |
| Minimum Initial (s)     |                                                                                    |      |      | 5.0                                                                               |      | 5.0                                                                                 | 5.0                                                                                 | 10.0                                                                                |      |      | 10.0                                                                                |      |
| Minimum Split (s)       |                                                                                    |      |      | 20.0                                                                              |      | 20.0                                                                                | 9.0                                                                                 | 20.0                                                                                |      |      | 22.4                                                                                |      |
| Total Split (s)         | 0.0                                                                                | 0.0  | 0.0  | 20.0                                                                              | 0.0  | 20.0                                                                                | 38.0                                                                                | 80.0                                                                                | 0.0  | 0.0  | 42.0                                                                                | 0.0  |
| Total Split (%)         | 0.0%                                                                               | 0.0% | 0.0% | 20.0%                                                                             | 0.0% | 20.0%                                                                               | 38.0%                                                                               | 80.0%                                                                               | 0.0% | 0.0% | 42.0%                                                                               | 0.0% |
| Yellow Time (s)         |                                                                                    |      |      | 3.2                                                                               |      | 3.2                                                                                 | 3.0                                                                                 | 3.9                                                                                 |      |      | 3.9                                                                                 |      |
| All-Red Time (s)        |                                                                                    |      |      | 2.0                                                                               |      | 2.0                                                                                 | 1.0                                                                                 | 1.5                                                                                 |      |      | 1.5                                                                                 |      |
| Lost Time Adjust (s)    | 0.0                                                                                | 0.0  | 0.0  | 0.0                                                                               | 0.0  | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0  | 0.0  | 0.0                                                                                 | 0.0  |
| Total Lost Time (s)     | 4.0                                                                                | 4.0  | 4.0  | 5.2                                                                               | 4.0  | 5.2                                                                                 | 4.0                                                                                 | 5.4                                                                                 | 4.0  | 4.0  | 5.4                                                                                 | 4.0  |
| Lead/Lag                |                                                                                    |      |      |                                                                                   |      |                                                                                     | Lag                                                                                 |                                                                                     |      |      | Lead                                                                                |      |
| Lead-Lag Optimize?      |                                                                                    |      |      |                                                                                   |      |                                                                                     | Yes                                                                                 |                                                                                     |      |      | Yes                                                                                 |      |
| Recall Mode             |                                                                                    |      |      | None                                                                              |      | None                                                                                | None                                                                                | C-Min                                                                               |      |      | C-Min                                                                               |      |
| Act Effect Green (s)    |                                                                                    |      |      | 10.0                                                                              |      | 10.0                                                                                | 83.0                                                                                | 82.7                                                                                |      |      | 50.7                                                                                |      |
| Actuated g/C Ratio      |                                                                                    |      |      | 0.10                                                                              |      | 0.10                                                                                | 0.83                                                                                | 0.83                                                                                |      |      | 0.51                                                                                |      |
| v/c Ratio               |                                                                                    |      |      | 0.56                                                                              |      | 0.13                                                                                | 0.72                                                                                | 0.49                                                                                |      |      | 0.53                                                                                |      |
| Control Delay           |                                                                                    |      |      | 54.2                                                                              |      | 17.3                                                                                | 13.0                                                                                | 1.9                                                                                 |      |      | 15.2                                                                                |      |
| Queue Delay             |                                                                                    |      |      | 0.0                                                                               |      | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |      |      | 0.0                                                                                 |      |
| Total Delay             |                                                                                    |      |      | 54.2                                                                              |      | 17.3                                                                                | 13.0                                                                                | 1.9                                                                                 |      |      | 15.2                                                                                |      |
| LOS                     |                                                                                    |      |      | D                                                                                 |      | B                                                                                   | B                                                                                   | A                                                                                   |      |      | B                                                                                   |      |
| Approach Delay          |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     | 4.8                                                                                 |      |      | 15.2                                                                                |      |
| Approach LOS            |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     | A                                                                                   |      |      | B                                                                                   |      |
| Queue Length 50th (ft)  |                                                                                    |      |      | 64                                                                                |      | 0                                                                                   | 77                                                                                  | 67                                                                                  |      |      | 182                                                                                 |      |
| Queue Length 95th (ft)  |                                                                                    |      |      | 113                                                                               |      | 22                                                                                  | 140                                                                                 | 89                                                                                  |      |      | 336                                                                                 |      |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 190                                                                               |                                                                                   |                                                                                   | 385                                                                               |                                                                                   |                                                                                    | 689                                                                                 |                                                                                     |                                                                                     | 701                                                                                 |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 150                                                                               | 215                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Base Capacity (vph)     |                                                                                   |                                                                                   |                                                                                   | 270                                                                               |                                                                                   | 240                                                                               | 798                                                                                | 2898                                                                                |                                                                                     |                                                                                     | 1745                                                                                |                                                                                     |
| Starvation Cap Reductn  |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     |                                                                                     | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     |                                                                                     | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     |                                                                                     | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       |                                                                                   |                                                                                   |                                                                                   | 0.38                                                                              |                                                                                   | 0.09                                                                              | 0.63                                                                               | 0.49                                                                                |                                                                                     |                                                                                     | 0.53                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 92 (92%), Referenced to phase 2:SBT and 6:NBTL, Start of Green

Natural Cycle: 70

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.72

Intersection Signal Delay: 9.8

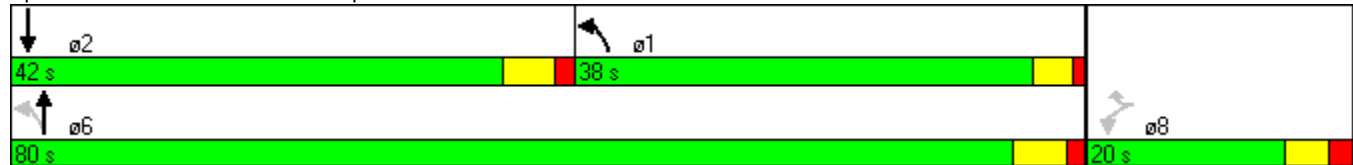
Intersection LOS: A

Intersection Capacity Utilization 74.4%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 3: North Ramp & Centennial Rd



|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |                                                                                   |  |  |                                                                                   |  |  |  |  |                                                                                     |  |  |                                                                                     |
| Volume (veh/h)                    | 19                                                                                | 3                                                                                 | 117                                                                               | 162                                                                               | 2                                                                                 | 102                                                                               | 184                                                                                 | 1581                                                                                | 286                                                                                 | 62                                                                                  | 749                                                                                 | 21                                                                                  |
| Sign Control                      |                                                                                   | Stop                                                                              |                                                                                   |                                                                                   | Stop                                                                              |                                                                                   |                                                                                     | Free                                                                                |                                                                                     |                                                                                     | Free                                                                                |                                                                                     |
| Grade                             |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Peak Hour Factor                  | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Hourly flow rate (vph)            | 21                                                                                | 3                                                                                 | 127                                                                               | 176                                                                               | 2                                                                                 | 111                                                                               | 200                                                                                 | 1718                                                                                | 311                                                                                 | 67                                                                                  | 814                                                                                 | 23                                                                                  |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Width (ft)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Walking Speed (ft/s)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Right turn flare (veh)            |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Median type                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     | None                                                                                |                                                                                     |                                                                                     | None                                                                                |                                                                                     |
| Median storage veh                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Upstream signal (ft)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 781                                                                                 |                                                                                     |                                                                                     | 1308                                                                                |                                                                                     |
| pX, platoon unblocked             | 0.89                                                                              | 0.89                                                                              | 0.97                                                                              | 0.89                                                                              | 0.89                                                                              | 0.87                                                                              | 0.97                                                                                |                                                                                     |                                                                                     | 0.87                                                                                |                                                                                     |                                                                                     |
| vC, conflicting volume            | 2221                                                                              | 3390                                                                              | 418                                                                               | 2817                                                                              | 3246                                                                              | 1015                                                                              | 837                                                                                 |                                                                                     |                                                                                     | 2029                                                                                |                                                                                     |                                                                                     |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vCu, unblocked vol                | 1962                                                                              | 3278                                                                              | 334                                                                               | 2634                                                                              | 3116                                                                              | 724                                                                               | 766                                                                                 |                                                                                     |                                                                                     | 1887                                                                                |                                                                                     |                                                                                     |
| tC, single (s)                    | 7.5                                                                               | 6.5                                                                               | 6.9                                                                               | 7.5                                                                               | 6.5                                                                               | 6.9                                                                               | 4.1                                                                                 |                                                                                     |                                                                                     | 4.1                                                                                 |                                                                                     |                                                                                     |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| tF (s)                            | 3.5                                                                               | 4.0                                                                               | 3.3                                                                               | 3.5                                                                               | 4.0                                                                               | 3.3                                                                               | 2.2                                                                                 |                                                                                     |                                                                                     | 2.2                                                                                 |                                                                                     |                                                                                     |
| p0 queue free %                   | 0                                                                                 | 26                                                                                | 80                                                                                | 0                                                                                 | 62                                                                                | 65                                                                                | 76                                                                                  |                                                                                     |                                                                                     | 75                                                                                  |                                                                                     |                                                                                     |
| cM capacity (veh/h)               | 11                                                                                | 4                                                                                 | 641                                                                               | 2                                                                                 | 6                                                                                 | 321                                                                               | 816                                                                                 |                                                                                     |                                                                                     | 273                                                                                 |                                                                                     |                                                                                     |
| Direction, Lane #                 | EB 1                                                                              | WB 1                                                                              | NB 1                                                                              | NB 2                                                                              | NB 3                                                                              | SB 1                                                                              | SB 2                                                                                | SB 3                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Total                      | 151                                                                               | 289                                                                               | 200                                                                               | 1146                                                                              | 884                                                                               | 67                                                                                | 543                                                                                 | 294                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Left                       | 21                                                                                | 176                                                                               | 200                                                                               | 0                                                                                 | 0                                                                                 | 67                                                                                | 0                                                                                   | 0                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Right                      | 127                                                                               | 111                                                                               | 0                                                                                 | 0                                                                                 | 311                                                                               | 0                                                                                 | 0                                                                                   | 23                                                                                  |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| cSH                               | 59                                                                                | 4                                                                                 | 816                                                                               | 1700                                                                              | 1700                                                                              | 273                                                                               | 1700                                                                                | 1700                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume to Capacity                | 2.58                                                                              | 77.76                                                                             | 0.24                                                                              | 0.67                                                                              | 0.52                                                                              | 0.25                                                                              | 0.32                                                                                | 0.17                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Queue Length 95th (ft)            | 382                                                                               | Err                                                                               | 24                                                                                | 0                                                                                 | 0                                                                                 | 24                                                                                | 0                                                                                   | 0                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Control Delay (s)                 | 865.3                                                                             | Err                                                                               | 10.8                                                                              | 0.0                                                                               | 0.0                                                                               | 22.4                                                                              | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane LOS                          | F                                                                                 | F                                                                                 | B                                                                                 |                                                                                   |                                                                                   | C                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach Delay (s)                | 865.3                                                                             | Err                                                                               | 1.0                                                                               |                                                                                   |                                                                                   | 1.7                                                                               |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach LOS                      | F                                                                                 | F                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Average Delay                     |                                                                                   |                                                                                   | 846.5                                                                             |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 82.0%                                                                             | ICU Level of Service                                                              |                                                                                   |                                                                                   |                                                                                     |                                                                                     | E                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

|                         |  |  |  |  |  |  |   |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |                                                                                   |  |  |                                                                                   |  |  |                                                                                     |  |  |  |
| Volume (vph)            | 79                                                                                | 244                                                                               | 205                                                                               | 187                                                                               | 150                                                                               | 37                                                                                | 205                                                                                 | 649                                                                                 | 279                                                                                 | 55                                                                                  | 381                                                                                 | 47                                                                                  |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 215                                                                               |                                                                                   | 0                                                                                 | 215                                                                               |                                                                                   | 0                                                                                 | 215                                                                                 |                                                                                     | 0                                                                                   | 215                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                   |                                                                                     | 0                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                  |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 35                                                                                |                                                                                   |                                                                                   | 35                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 606                                                                               |                                                                                   |                                                                                   | 618                                                                               |                                                                                   |                                                                                     | 1308                                                                                |                                                                                     |                                                                                     | 505                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 11.8                                                                              |                                                                                   |                                                                                   | 12.0                                                                              |                                                                                   |                                                                                     | 22.3                                                                                |                                                                                     |                                                                                     | 8.6                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 86                                                                                | 488                                                                               | 0                                                                                 | 203                                                                               | 203                                                                               | 0                                                                                 | 223                                                                                 | 1008                                                                                | 0                                                                                   | 60                                                                                  | 465                                                                                 | 0                                                                                   |
| Turn Type               | pm+pt                                                                             |                                                                                   |                                                                                   | pm+pt                                                                             |                                                                                   |                                                                                   | pm+pt                                                                               |                                                                                     |                                                                                     | pm+pt                                                                               |                                                                                     |                                                                                     |
| Protected Phases        | 7                                                                                 | 4                                                                                 |                                                                                   | 3                                                                                 | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   |                                                                                   | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 7                                                                                 | 4                                                                                 |                                                                                   | 3                                                                                 | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 4.0                                                                               | 10.0                                                                              |                                                                                   | 4.0                                                                               | 10.0                                                                              |                                                                                   | 4.0                                                                                 | 6.0                                                                                 |                                                                                     | 4.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 8.0                                                                               | 15.7                                                                              |                                                                                   | 8.0                                                                               | 15.7                                                                              |                                                                                   | 8.0                                                                                 | 11.5                                                                                |                                                                                     | 8.0                                                                                 | 11.5                                                                                |                                                                                     |
| Total Split (s)         | 14.0                                                                              | 38.0                                                                              | 0.0                                                                               | 14.0                                                                              | 38.0                                                                              | 0.0                                                                               | 19.0                                                                                | 36.0                                                                                | 0.0                                                                                 | 12.0                                                                                | 29.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 14.0%                                                                             | 38.0%                                                                             | 0.0%                                                                              | 14.0%                                                                             | 38.0%                                                                             | 0.0%                                                                              | 19.0%                                                                               | 36.0%                                                                               | 0.0%                                                                                | 12.0%                                                                               | 29.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.5                                                                               | 3.9                                                                               |                                                                                   | 3.5                                                                               | 3.9                                                                               |                                                                                   | 3.5                                                                                 | 3.6                                                                                 |                                                                                     | 3.5                                                                                 | 3.6                                                                                 |                                                                                     |
| All-Red Time (s)        | 0.5                                                                               | 1.8                                                                               |                                                                                   | 0.5                                                                               | 1.8                                                                               |                                                                                   | 0.5                                                                                 | 1.9                                                                                 |                                                                                     | 0.5                                                                                 | 1.9                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 5.7                                                                               | 4.0                                                                               | 4.0                                                                               | 5.7                                                                               | 4.0                                                                               | 4.0                                                                                 | 5.5                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 5.5                                                                                 | 4.0                                                                                 |
| Lead/Lag                | Lead                                                                              | Lag                                                                               |                                                                                   | Lead                                                                              | Lag                                                                               |                                                                                   | Lag                                                                                 | Lead                                                                                |                                                                                     | Lag                                                                                 | Lead                                                                                |                                                                                     |
| Lead-Lag Optimize?      | Yes                                                                               | Yes                                                                               |                                                                                   | Yes                                                                               | Yes                                                                               |                                                                                   | Yes                                                                                 | Yes                                                                                 |                                                                                     | Yes                                                                                 | Yes                                                                                 |                                                                                     |
| Recall Mode             | None                                                                              | Max                                                                               |                                                                                   | None                                                                              | Max                                                                               |                                                                                   | None                                                                                | C-Max                                                                               |                                                                                     | None                                                                                | C-Max                                                                               |                                                                                     |
| Act Effect Green (s)    | 42.1                                                                              | 32.3                                                                              |                                                                                   | 47.7                                                                              | 37.0                                                                              |                                                                                   | 43.2                                                                                | 33.5                                                                                |                                                                                     | 33.6                                                                                | 26.0                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.42                                                                              | 0.32                                                                              |                                                                                   | 0.48                                                                              | 0.37                                                                              |                                                                                   | 0.43                                                                                | 0.34                                                                                |                                                                                     | 0.34                                                                                | 0.26                                                                                |                                                                                     |
| v/c Ratio               | 0.16                                                                              | 0.83                                                                              |                                                                                   | 0.64                                                                              | 0.30                                                                              |                                                                                   | 0.52                                                                                | 0.86                                                                                |                                                                                     | 0.31                                                                                | 0.51                                                                                |                                                                                     |
| Control Delay           | 14.7                                                                              | 41.8                                                                              |                                                                                   | 25.3                                                                              | 23.5                                                                              |                                                                                   | 27.3                                                                                | 34.8                                                                                |                                                                                     | 28.7                                                                                | 33.9                                                                                |                                                                                     |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                                 | 0.0                                                                                 |                                                                                     | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |
| Total Delay             | 14.7                                                                              | 41.8                                                                              |                                                                                   | 25.3                                                                              | 23.5                                                                              |                                                                                   | 27.3                                                                                | 34.8                                                                                |                                                                                     | 28.7                                                                                | 33.9                                                                                |                                                                                     |
| LOS                     | B                                                                                 | D                                                                                 |                                                                                   | C                                                                                 | C                                                                                 |                                                                                   | C                                                                                   | C                                                                                   |                                                                                     | C                                                                                   | C                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 37.7                                                                              |                                                                                   |                                                                                   | 24.4                                                                              |                                                                                   |                                                                                     | 33.4                                                                                |                                                                                     |                                                                                     | 33.3                                                                                |                                                                                     |
| Approach LOS            |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | C                                                                                 |                                                                                   |                                                                                     | C                                                                                   |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 28                                                                                | 262                                                                               |                                                                                   | 70                                                                                | 85                                                                                |                                                                                   | 92                                                                                  | 323                                                                                 |                                                                                     | 23                                                                                  | 134                                                                                 |                                                                                     |
| Queue Length 95th (ft)  | 56                                                                                | #433                                                                              |                                                                                   | #133                                                                              | 153                                                                               |                                                                                   | 125                                                                                 | #435                                                                                |                                                                                     | 46                                                                                  | 186                                                                                 |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 526                                                                               |                                                                                   |                                                                                   | 538                                                                               |                                                                                   |                                                                                    | 1228                                                                                |                                                                                     |                                                                                     | 425                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 215                                                                               |                                                                                   |                                                                                   | 215                                                                               |                                                                                   |                                                                                   | 215                                                                                |                                                                                     |                                                                                     | 215                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 577                                                                               | 591                                                                               |                                                                                   | 320                                                                               | 676                                                                               |                                                                                   | 489                                                                                | 1178                                                                                |                                                                                     | 226                                                                                 | 915                                                                                 |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.15                                                                              | 0.83                                                                              |                                                                                   | 0.63                                                                              | 0.30                                                                              |                                                                                   | 0.46                                                                               | 0.86                                                                                |                                                                                     | 0.27                                                                                | 0.51                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 64 (64%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.86

Intersection Signal Delay: 33.0

Intersection LOS: C

Intersection Capacity Utilization 81.9%

ICU Level of Service D

Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 5: Century Ave & Centennial Rd

|                                                                                        |                                                                                        |                                                                                        |                                                                                          |
|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
|  ø2 |  ø1 |  ø3 |  ø4  |
| 29 s                                                                                   | 19 s                                                                                   | 14 s                                                                                   | 38 s                                                                                     |
|  ø6 |  ø5 |  ø7 |  ø8 |
| 36 s                                                                                   | 12 s                                                                                   | 14 s                                                                                   | 38 s                                                                                     |

## **Appendix L: 2024 - Signal at Trenton AM (2B1)**

Exit 161 Operational Study  
Bismarck, ND

1: Divide Ave & Bismarck Expy

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |                                                                                   |  |  |  |  |  |  |  |  |  |
| Volume (vph)            | 106                                                                               | 114                                                                               | 16                                                                                | 110                                                                               | 75                                                                                | 258                                                                               | 25                                                                                  | 430                                                                                 | 72                                                                                  | 370                                                                                 | 1268                                                                                | 283                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 150                                                                               |                                                                                   | 0                                                                                 | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                 |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                   |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 100                                                                               |                                                                                   | 25                                                                                | 100                                                                               |                                                                                   | 100                                                                               | 100                                                                                 |                                                                                     | 150                                                                                 | 100                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 25                                                                                |                                                                                   |                                                                                   | 25                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 371                                                                               |                                                                                   |                                                                                   | 341                                                                               |                                                                                   |                                                                                     | 614                                                                                 |                                                                                     |                                                                                     | 458                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 10.1                                                                              |                                                                                   |                                                                                   | 9.3                                                                               |                                                                                   |                                                                                     | 10.5                                                                                |                                                                                     |                                                                                     | 7.8                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 13%                                                                               | 5%                                                                                | 0%                                                                                | 6%                                                                                | 17%                                                                               | 26%                                                                               | 4%                                                                                  | 9%                                                                                  | 18%                                                                                 | 2%                                                                                  | 1%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 115                                                                               | 141                                                                               | 0                                                                                 | 120                                                                               | 82                                                                                | 280                                                                               | 27                                                                                  | 467                                                                                 | 78                                                                                  | 402                                                                                 | 1686                                                                                | 0                                                                                   |
| Turn Type               | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                              |                                                                                   | pm+ov                                                                             | Perm                                                                                |                                                                                     | Perm                                                                                | pm+pt                                                                               |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 | 5                                                                                 |                                                                                     | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                   |                                                                                     | 6                                                                                   | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 | 4                                                                                 |                                                                                   | 8                                                                                 | 8                                                                                 | 5                                                                                 | 6                                                                                   | 6                                                                                   | 6                                                                                   | 5                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               | 6.0                                                                               |                                                                                   | 6.0                                                                               | 6.0                                                                               | 5.0                                                                               | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 5.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 30.0                                                                              | 30.0                                                                              |                                                                                   | 30.0                                                                              | 30.0                                                                              | 9.8                                                                               | 22.9                                                                                | 22.9                                                                                | 22.9                                                                                | 9.8                                                                                 | 28.7                                                                                |                                                                                     |
| Total Split (s)         | 30.0                                                                              | 30.0                                                                              | 0.0                                                                               | 30.0                                                                              | 30.0                                                                              | 25.4                                                                              | 44.6                                                                                | 44.6                                                                                | 44.6                                                                                | 25.4                                                                                | 70.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 30.0%                                                                             | 30.0%                                                                             | 0.0%                                                                              | 30.0%                                                                             | 30.0%                                                                             | 25.4%                                                                             | 44.6%                                                                               | 44.6%                                                                               | 44.6%                                                                               | 25.4%                                                                               | 70.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 3.0                                                                               | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 | 3.0                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 1.0                                                                               | 1.8                                                                                 | 1.8                                                                                 | 1.8                                                                                 | 1.0                                                                                 | 1.8                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 5.7                                                                                 | 5.7                                                                                 | 5.7                                                                                 | 4.0                                                                                 | 5.7                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lead                                                                              | Lag                                                                                 | Lag                                                                                 | Lag                                                                                 | Lead                                                                                |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                               | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 |                                                                                     |                                                                                     |
| Recall Mode             | None                                                                              | None                                                                              |                                                                                   | None                                                                              | None                                                                              | None                                                                              | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               | None                                                                                | C-Min                                                                               |                                                                                     |
| Act Effect Green (s)    | 15.5                                                                              | 15.5                                                                              |                                                                                   | 15.5                                                                              | 15.5                                                                              | 35.5                                                                              | 54.8                                                                                | 54.8                                                                                | 54.8                                                                                | 74.5                                                                                | 72.8                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.16                                                                              | 0.16                                                                              |                                                                                   | 0.16                                                                              | 0.16                                                                              | 0.36                                                                              | 0.55                                                                                | 0.55                                                                                | 0.55                                                                                | 0.74                                                                                | 0.73                                                                                |                                                                                     |
| v/c Ratio               | 0.63                                                                              | 0.50                                                                              |                                                                                   | 0.70                                                                              | 0.33                                                                              | 0.47                                                                              | 0.20                                                                                | 0.26                                                                                | 0.10                                                                                | 0.54                                                                                | 0.66                                                                                |                                                                                     |
| Control Delay           | 53.6                                                                              | 42.0                                                                              |                                                                                   | 60.6                                                                              | 39.3                                                                              | 6.9                                                                               | 21.3                                                                                | 14.3                                                                                | 4.4                                                                                 | 5.3                                                                                 | 5.1                                                                                 |                                                                                     |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.1                                                                                 | 0.1                                                                                 |                                                                                     |
| Total Delay             | 53.6                                                                              | 42.0                                                                              |                                                                                   | 60.6                                                                              | 39.3                                                                              | 6.9                                                                               | 21.3                                                                                | 14.3                                                                                | 4.4                                                                                 | 5.4                                                                                 | 5.2                                                                                 |                                                                                     |
| LOS                     | D                                                                                 | D                                                                                 |                                                                                   | E                                                                                 | D                                                                                 | A                                                                                 | C                                                                                   | B                                                                                   | A                                                                                   | A                                                                                   | A                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 47.2                                                                              |                                                                                   |                                                                                   | 25.8                                                                              |                                                                                   |                                                                                     | 13.2                                                                                |                                                                                     |                                                                                     | 5.2                                                                                 |                                                                                     |
| Approach LOS            |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | C                                                                                 |                                                                                   |                                                                                     | B                                                                                   |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 69                                                                                | 80                                                                                |                                                                                   | 74                                                                                | 47                                                                                | 23                                                                                | 8                                                                                   | 75                                                                                  | 0                                                                                   | 50                                                                                  | 155                                                                                 |                                                                                     |
| Queue Length 95th (ft)  | 119                                                                               | 129                                                                               |                                                                                   | 125                                                                               | 85                                                                                | 64                                                                                | 36                                                                                  | 146                                                                                 | 28                                                                                  | m82                                                                                 | 198                                                                                 |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 291                                                                               |                                                                                   |                                                                                   | 261                                                                               |                                                                                   |                                                                                    | 534                                                                                 |                                                                                     |                                                                                     | 378                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 150                                                                               |                                                                                   |                                                                                   | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 284                                                                               | 433                                                                               |                                                                                   | 265                                                                               | 390                                                                               | 679                                                                               | 136                                                                                | 1816                                                                                | 786                                                                                 | 813                                                                                 | 2543                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 30                                                                                  | 142                                                                                 |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.40                                                                              | 0.33                                                                              |                                                                                   | 0.45                                                                              | 0.21                                                                              | 0.41                                                                              | 0.20                                                                               | 0.26                                                                                | 0.10                                                                                | 0.51                                                                                | 0.70                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 39 (39%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.70

Intersection Signal Delay: 12.6

Intersection LOS: B

Intersection Capacity Utilization 81.6%

ICU Level of Service D

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Divide Ave & Bismarck Expy

|                                                                                        |                                                                                          |
|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
|  ø2  |  ø4  |
| 70 s                                                                                   | 30 s                                                                                     |
|  ø5 |  ø8 |
| 25.4 s                                                                                 | 30 s                                                                                     |
|  ø6 |                                                                                          |
| 44.6 s                                                                                 |                                                                                          |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |                                                                                   |  |                                                                                   |                                                                                   |                                                                                   |                                                                                    |  |  |  |  |  |
| Volume (vph)            | 143                                                                               | 0                                                                                 | 580                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 693                                                                                 | 101                                                                                 | 27                                                                                  | 1063                                                                                | 0                                                                                   |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                 | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 0                                                                                 |                                                                                   | 175                                                                               | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  |                                                                                     | 0                                                                                   | 222                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 1                                                                                 |                                                                                   | 1                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 300                                                                               | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                 |                                                                                     | 25                                                                                  | 150                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                    |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                    | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 575                                                                               |                                                                                   |                                                                                   | 383                                                                               |                                                                                   |                                                                                    | 458                                                                                 |                                                                                     |                                                                                     | 769                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 13.1                                                                              |                                                                                   |                                                                                   | 8.7                                                                               |                                                                                   |                                                                                    | 7.8                                                                                 |                                                                                     |                                                                                     | 13.1                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                               | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                               | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 4%                                                                                | 0%                                                                                | 3%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 0%                                                                                 | 13%                                                                                 | 29%                                                                                 | 13%                                                                                 | 2%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 155                                                                               | 0                                                                                 | 630                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 753                                                                                 | 110                                                                                 | 29                                                                                  | 1155                                                                                | 0                                                                                   |
| Turn Type               | custom                                                                            |                                                                                   | custom                                                                            |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     | Perm                                                                                | Perm                                                                                |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     | 6                                                                                   | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                   | 6                                                                                   | 2                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               |                                                                                   | 6.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 21.1                                                                              |                                                                                   | 21.1                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 23.4                                                                                | 23.4                                                                                | 21.4                                                                                | 21.4                                                                                |                                                                                     |
| Total Split (s)         | 54.0                                                                              | 0.0                                                                               | 54.0                                                                              | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 46.0                                                                                | 46.0                                                                                | 46.0                                                                                | 46.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 54.0%                                                                             | 0.0%                                                                              | 54.0%                                                                             | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                               | 46.0%                                                                               | 46.0%                                                                               | 46.0%                                                                               | 46.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.6                                                                               |                                                                                   | 3.6                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 1.5                                                                               |                                                                                   | 1.5                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 1.5                                                                                 | 1.5                                                                                 | 1.5                                                                                 | 1.5                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 5.1                                                                               | 4.0                                                                               | 5.1                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                                | 5.4                                                                                 | 5.4                                                                                 | 5.4                                                                                 | 5.4                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Recall Mode             | None                                                                              |                                                                                   | None                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               |                                                                                     |
| Act Effct Green (s)     | 44.1                                                                              |                                                                                   | 44.1                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 45.4                                                                                | 45.4                                                                                | 45.4                                                                                | 45.4                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.44                                                                              |                                                                                   | 0.44                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.45                                                                                | 0.45                                                                                | 0.45                                                                                | 0.45                                                                                |                                                                                     |
| v/c Ratio               | 0.20                                                                              |                                                                                   | 0.89                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.52                                                                                | 0.18                                                                                | 0.13                                                                                | 0.72                                                                                |                                                                                     |
| Control Delay           | 16.7                                                                              |                                                                                   | 40.8                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 19.3                                                                                | 3.6                                                                                 | 4.4                                                                                 | 7.4                                                                                 |                                                                                     |
| Queue Delay             | 0.0                                                                               |                                                                                   | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |
| Total Delay             | 16.7                                                                              |                                                                                   | 40.8                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 19.3                                                                                | 3.6                                                                                 | 4.4                                                                                 | 7.4                                                                                 |                                                                                     |
| LOS                     | B                                                                                 |                                                                                   | D                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | B                                                                                   | A                                                                                   | A                                                                                   | A                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 17.3                                                                                |                                                                                     |                                                                                     | 7.3                                                                                 |                                                                                     |
| Approach LOS            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | B                                                                                   |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 56                                                                                |                                                                                   | 333                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 205                                                                                 | 5                                                                                   | 0                                                                                   | 191                                                                                 |                                                                                     |
| Queue Length 95th (ft)  | 91                                                                                |                                                                                   | #499                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 160                                                                                 | 19                                                                                  | m5                                                                                  | m175                                                                                |                                                                                     |

|                                                                        |  |  |  |  |  |  |  |  |  |  |  |  |
|------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group                                                             | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft)                                                |                                                                                   | 495                                                                               |                                                                                   |                                                                                   | 303                                                                               |                                                                                   |                                                                                    | 378                                                                                 |                                                                                     |                                                                                     | 689                                                                                 |                                                                                     |
| Turn Bay Length (ft)                                                   |                                                                                   |                                                                                   | 175                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | 222                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)                                                    | 849                                                                               |                                                                                   | 779                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 1449                                                                                | 628                                                                                 | 217                                                                                 | 1605                                                                                |                                                                                     |
| Starvation Cap Reductn                                                 | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn                                                  | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn                                                    | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio                                                      | 0.18                                                                              |                                                                                   | 0.81                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.52                                                                                | 0.18                                                                                | 0.13                                                                                | 0.72                                                                                |                                                                                     |
| Intersection Summary                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Area Type:                                                             | Other                                                                             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Cycle Length: 100                                                      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Cycle Length: 100                                             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Offset: 30 (30%), Referenced to phase 2:SBTL and 6:NBT, Start of Green |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Natural Cycle: 60                                                      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Control Type: Actuated-Coordinated                                     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Maximum v/c Ratio: 0.89                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Signal Delay: 18.3                                        |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Intersection LOS: B                                                               |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization 98.9%                                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | ICU Level of Service F                                                            |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min) 15                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| # 95th percentile volume exceeds capacity, queue may be longer.        |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Queue shown is maximum after two cycles.                               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| m Volume for 95th percentile queue is metered by upstream signal.      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

Splits and Phases: 2: South Ramp & Centennial Rd

|                                                                                        |                                                                                        |
|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
|  ø2 |  ø4 |
| 46 s                                                                                   | 54 s                                                                                   |
|  ø6 |                                                                                        |
| 46 s                                                                                   |                                                                                        |

|                         |  |      |      |                                                                                   |      |                                                                                     |                                                                                     |                                                                                     |      |      |                                                                                     |      |
|-------------------------|------------------------------------------------------------------------------------|------|------|-----------------------------------------------------------------------------------|------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------|------|-------------------------------------------------------------------------------------|------|
| Lane Group              | EBL                                                                                | EBT  | EBR  | WBL                                                                               | WBT  | WBR                                                                                 | NBL                                                                                 | NBT                                                                                 | NBR  | SBL  | SBT                                                                                 | SBR  |
| Lane Configurations     |                                                                                    |      |      |  |      |  |  |  |      |      |  |      |
| Volume (vph)            | 0                                                                                  | 0    | 0    | 87                                                                                | 0    | 9                                                                                   | 412                                                                                 | 529                                                                                 | 0    | 0    | 1700                                                                                | 380  |
| Ideal Flow (vphpl)      | 1900                                                                               | 1900 | 1900 | 1900                                                                              | 1900 | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900 | 1900 | 1900                                                                                | 1900 |
| Lane Width (ft)         | 12                                                                                 | 12   | 12   | 16                                                                                | 12   | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12   | 12   | 12                                                                                  | 12   |
| Grade (%)               |                                                                                    | 0%   |      |                                                                                   | 0%   |                                                                                     |                                                                                     | 0%                                                                                  |      |      | 0%                                                                                  |      |
| Storage Length (ft)     | 0                                                                                  |      | 0    | 0                                                                                 |      | 150                                                                                 | 215                                                                                 |                                                                                     | 0    | 0    |                                                                                     | 0    |
| Storage Lanes           | 0                                                                                  |      | 0    | 1                                                                                 |      | 1                                                                                   | 1                                                                                   |                                                                                     | 0    | 0    |                                                                                     | 0    |
| Taper Length (ft)       | 25                                                                                 |      | 25   | 25                                                                                |      | 100                                                                                 | 150                                                                                 |                                                                                     | 25   | 25   |                                                                                     | 25   |
| Right Turn on Red       |                                                                                    |      | Yes  |                                                                                   |      | Yes                                                                                 |                                                                                     |                                                                                     | Yes  |      |                                                                                     | Yes  |
| Link Speed (mph)        |                                                                                    | 30   |      |                                                                                   | 30   |                                                                                     |                                                                                     | 40                                                                                  |      |      | 40                                                                                  |      |
| Link Distance (ft)      |                                                                                    | 270  |      |                                                                                   | 465  |                                                                                     |                                                                                     | 769                                                                                 |      |      | 783                                                                                 |      |
| Travel Time (s)         |                                                                                    | 6.1  |      |                                                                                   | 10.6 |                                                                                     |                                                                                     | 13.1                                                                                |      |      | 13.3                                                                                |      |
| Confl. Peds. (#/hr)     |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     |                                                                                     |      |      |                                                                                     |      |
| Confl. Bikes (#/hr)     |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     |                                                                                     |      |      |                                                                                     |      |
| Peak Hour Factor        | 0.92                                                                               | 0.92 | 0.92 | 0.92                                                                              | 0.92 | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92 | 0.92 | 0.92                                                                                | 0.92 |
| Growth Factor           | 100%                                                                               | 100% | 100% | 100%                                                                              | 100% | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100% | 100% | 100%                                                                                | 100% |
| Heavy Vehicles (%)      | 2%                                                                                 | 2%   | 2%   | 10%                                                                               | 2%   | 33%                                                                                 | 7%                                                                                  | 4%                                                                                  | 2%   | 2%   | 1%                                                                                  | 1%   |
| Bus Blockages (#/hr)    | 0                                                                                  | 0    | 0    | 0                                                                                 | 0    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0    | 0    | 0                                                                                   | 0    |
| Parking (#/hr)          |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     |                                                                                     |      |      |                                                                                     |      |
| Mid-Block Traffic (%)   |                                                                                    | 0%   |      |                                                                                   | 0%   |                                                                                     |                                                                                     | 0%                                                                                  |      |      | 0%                                                                                  |      |
| Shared Lane Traffic (%) |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     |                                                                                     |      |      |                                                                                     |      |
| Lane Group Flow (vph)   | 0                                                                                  | 0    | 0    | 95                                                                                | 0    | 10                                                                                  | 448                                                                                 | 575                                                                                 | 0    | 0    | 2261                                                                                | 0    |
| Turn Type               |                                                                                    |      |      | custom                                                                            |      | custom                                                                              | pm+pt                                                                               |                                                                                     |      |      |                                                                                     |      |
| Protected Phases        |                                                                                    |      |      |                                                                                   |      |                                                                                     | 1                                                                                   | 6                                                                                   |      |      | 2                                                                                   |      |
| Permitted Phases        |                                                                                    |      |      | 8                                                                                 |      | 8                                                                                   | 6                                                                                   |                                                                                     |      |      |                                                                                     |      |
| Detector Phase          |                                                                                    |      |      | 8                                                                                 |      | 8                                                                                   | 1                                                                                   | 6                                                                                   |      |      | 2                                                                                   |      |
| Switch Phase            |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     |                                                                                     |      |      |                                                                                     |      |
| Minimum Initial (s)     |                                                                                    |      |      | 5.0                                                                               |      | 5.0                                                                                 | 4.0                                                                                 | 10.0                                                                                |      |      | 10.0                                                                                |      |
| Minimum Split (s)       |                                                                                    |      |      | 20.0                                                                              |      | 20.0                                                                                | 8.0                                                                                 | 20.0                                                                                |      |      | 22.4                                                                                |      |
| Total Split (s)         | 0.0                                                                                | 0.0  | 0.0  | 20.0                                                                              | 0.0  | 20.0                                                                                | 21.0                                                                                | 80.0                                                                                | 0.0  | 0.0  | 59.0                                                                                | 0.0  |
| Total Split (%)         | 0.0%                                                                               | 0.0% | 0.0% | 20.0%                                                                             | 0.0% | 20.0%                                                                               | 21.0%                                                                               | 80.0%                                                                               | 0.0% | 0.0% | 59.0%                                                                               | 0.0% |
| Yellow Time (s)         |                                                                                    |      |      | 3.2                                                                               |      | 3.2                                                                                 | 3.5                                                                                 | 3.9                                                                                 |      |      | 3.9                                                                                 |      |
| All-Red Time (s)        |                                                                                    |      |      | 2.0                                                                               |      | 2.0                                                                                 | 0.5                                                                                 | 1.5                                                                                 |      |      | 1.5                                                                                 |      |
| Lost Time Adjust (s)    | 0.0                                                                                | 0.0  | 0.0  | 0.0                                                                               | 0.0  | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0  | 0.0  | 0.0                                                                                 | 0.0  |
| Total Lost Time (s)     | 4.0                                                                                | 4.0  | 4.0  | 5.2                                                                               | 4.0  | 5.2                                                                                 | 4.0                                                                                 | 5.4                                                                                 | 4.0  | 4.0  | 5.4                                                                                 | 4.0  |
| Lead/Lag                |                                                                                    |      |      |                                                                                   |      |                                                                                     | Lag                                                                                 |                                                                                     |      |      | Lead                                                                                |      |
| Lead-Lag Optimize?      |                                                                                    |      |      |                                                                                   |      |                                                                                     | Yes                                                                                 |                                                                                     |      |      | Yes                                                                                 |      |
| Recall Mode             |                                                                                    |      |      | None                                                                              |      | None                                                                                | None                                                                                | C-Min                                                                               |      |      | C-Min                                                                               |      |
| Act Effect Green (s)    |                                                                                    |      |      | 9.5                                                                               |      | 9.5                                                                                 | 83.5                                                                                | 83.2                                                                                |      |      | 61.1                                                                                |      |
| Actuated g/C Ratio      |                                                                                    |      |      | 0.10                                                                              |      | 0.10                                                                                | 0.84                                                                                | 0.83                                                                                |      |      | 0.61                                                                                |      |
| v/c Ratio               |                                                                                    |      |      | 0.54                                                                              |      | 0.08                                                                                | 1.25                                                                                | 0.20                                                                                |      |      | 1.06                                                                                |      |
| Control Delay           |                                                                                    |      |      | 53.9                                                                              |      | 21.9                                                                                | 157.1                                                                               | 1.6                                                                                 |      |      | 49.2                                                                                |      |
| Queue Delay             |                                                                                    |      |      | 0.0                                                                               |      | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |      |      | 0.0                                                                                 |      |
| Total Delay             |                                                                                    |      |      | 53.9                                                                              |      | 21.9                                                                                | 157.1                                                                               | 1.6                                                                                 |      |      | 49.2                                                                                |      |
| LOS                     |                                                                                    |      |      | D                                                                                 |      | C                                                                                   | F                                                                                   | A                                                                                   |      |      | D                                                                                   |      |
| Approach Delay          |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     | 69.7                                                                                |      |      | 49.2                                                                                |      |
| Approach LOS            |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     | E                                                                                   |      |      | D                                                                                   |      |
| Queue Length 50th (ft)  |                                                                                    |      |      | 59                                                                                |      | 0                                                                                   | ~318                                                                                | 28                                                                                  |      |      | ~846                                                                                |      |
| Queue Length 95th (ft)  |                                                                                    |      |      | 106                                                                               |      | 15                                                                                  | #539                                                                                | 38                                                                                  |      |      | #1033                                                                               |      |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 190                                                                               |                                                                                   |                                                                                   | 385                                                                               |                                                                                   |                                                                                    | 689                                                                                 |                                                                                     |                                                                                     | 703                                                                                 |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 150                                                                               | 215                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Base Capacity (vph)     |                                                                                   |                                                                                   |                                                                                   | 275                                                                               |                                                                                   | 188                                                                               | 359                                                                                | 2886                                                                                |                                                                                     |                                                                                     | 2140                                                                                |                                                                                     |
| Starvation Cap Reductn  |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     |                                                                                     | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     |                                                                                     | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     |                                                                                     | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       |                                                                                   |                                                                                   |                                                                                   | 0.35                                                                              |                                                                                   | 0.05                                                                              | 1.25                                                                               | 0.20                                                                                |                                                                                     |                                                                                     | 1.06                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 4 (4%), Referenced to phase 2:SBT and 6:NBTL, Start of Green

Natural Cycle: 150

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.25

Intersection Signal Delay: 55.4

Intersection LOS: E

Intersection Capacity Utilization 98.9%

ICU Level of Service F

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 3: North Ramp & Centennial Rd



|                         |  |  |  |  |  |  |   |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |                                                                                   |  |  |                                                                                   |  |  |  |  |  |  |  |  |
| Volume (vph)            | 10                                                                                | 2                                                                                 | 290                                                                               | 122                                                                               | 6                                                                                 | 54                                                                                | 101                                                                                 | 467                                                                                 | 110                                                                                 | 27                                                                                  | 1644                                                                                | 27                                                                                  |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 0                                                                                 |                                                                                   | 200                                                                               | 0                                                                                 |                                                                                   | 200                                                                               | 550                                                                                 |                                                                                     | 0                                                                                   | 215                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 0                                                                                 |                                                                                   | 1                                                                                 | 0                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                   |                                                                                     | 0                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                  |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 638                                                                               |                                                                                   |                                                                                   | 313                                                                               |                                                                                   |                                                                                     | 783                                                                                 |                                                                                     |                                                                                     | 1307                                                                                |                                                                                     |
| Travel Time (s)         |                                                                                   | 14.5                                                                              |                                                                                   |                                                                                   | 7.1                                                                               |                                                                                   |                                                                                     | 13.3                                                                                |                                                                                     |                                                                                     | 22.3                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 17%                                                                               | 0%                                                                                | 1%                                                                                | 1%                                                                                | 0%                                                                                | 0%                                                                                | 10%                                                                                 | 9%                                                                                  | 2%                                                                                  | 12%                                                                                 | 2%                                                                                  | 14%                                                                                 |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 0                                                                                 | 13                                                                                | 315                                                                               | 0                                                                                 | 140                                                                               | 59                                                                                | 110                                                                                 | 628                                                                                 | 0                                                                                   | 29                                                                                  | 1816                                                                                | 0                                                                                   |
| Turn Type               | Perm                                                                              |                                                                                   | Perm                                                                              | Perm                                                                              |                                                                                   | Perm                                                                              | pm+pt                                                                               |                                                                                     |                                                                                     | Perm                                                                                |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 | 4                                                                                 | 4                                                                                 | 8                                                                                 | 8                                                                                 | 8                                                                                 | 1                                                                                   | 6                                                                                   |                                                                                     | 2                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 5.0                                                                                 | 4.0                                                                                 |                                                                                     | 4.0                                                                                 | 4.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 9.0                                                                                 | 20.0                                                                                |                                                                                     | 20.0                                                                                | 20.0                                                                                |                                                                                     |
| Total Split (s)         | 24.0                                                                              | 24.0                                                                              | 24.0                                                                              | 24.0                                                                              | 24.0                                                                              | 24.0                                                                              | 12.0                                                                                | 76.0                                                                                | 0.0                                                                                 | 64.0                                                                                | 64.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 24.0%                                                                             | 24.0%                                                                             | 24.0%                                                                             | 24.0%                                                                             | 24.0%                                                                             | 24.0%                                                                             | 12.0%                                                                               | 76.0%                                                                               | 0.0%                                                                                | 64.0%                                                                               | 64.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               | 3.5                                                                                 | 3.5                                                                                 |                                                                                     | 3.5                                                                                 | 3.5                                                                                 |                                                                                     |
| All-Red Time (s)        | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               | 0.5                                                                                 | 0.5                                                                                 |                                                                                     | 0.5                                                                                 | 0.5                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lead                                                                                |                                                                                     |                                                                                     | Lag                                                                                 | Lag                                                                                 |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 | Yes                                                                                 |                                                                                     |
| Recall Mode             | None                                                                              | None                                                                              | None                                                                              | None                                                                              | None                                                                              | None                                                                              | None                                                                                | C-Min                                                                               |                                                                                     | C-Min                                                                               | C-Min                                                                               |                                                                                     |
| Act Effect Green (s)    |                                                                                   | 15.9                                                                              | 15.9                                                                              |                                                                                   | 15.9                                                                              | 15.9                                                                              | 76.1                                                                                | 76.1                                                                                |                                                                                     | 65.0                                                                                | 65.0                                                                                |                                                                                     |
| Actuated g/C Ratio      |                                                                                   | 0.16                                                                              | 0.16                                                                              |                                                                                   | 0.16                                                                              | 0.16                                                                              | 0.76                                                                                | 0.76                                                                                |                                                                                     | 0.65                                                                                | 0.65                                                                                |                                                                                     |
| v/c Ratio               |                                                                                   | 0.06                                                                              | 0.84                                                                              |                                                                                   | 0.65                                                                              | 0.19                                                                              | 0.59                                                                                | 0.25                                                                                |                                                                                     | 0.06                                                                                | 0.79                                                                                |                                                                                     |
| Control Delay           |                                                                                   | 33.8                                                                              | 41.0                                                                              |                                                                                   | 52.4                                                                              | 10.7                                                                              | 21.7                                                                                | 6.2                                                                                 |                                                                                     | 2.6                                                                                 | 6.8                                                                                 |                                                                                     |
| Queue Delay             |                                                                                   | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 |                                                                                     | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |
| Total Delay             |                                                                                   | 33.8                                                                              | 41.0                                                                              |                                                                                   | 52.4                                                                              | 10.7                                                                              | 21.7                                                                                | 6.2                                                                                 |                                                                                     | 2.6                                                                                 | 6.8                                                                                 |                                                                                     |
| LOS                     |                                                                                   | C                                                                                 | D                                                                                 |                                                                                   | D                                                                                 | B                                                                                 | C                                                                                   | A                                                                                   |                                                                                     | A                                                                                   | A                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 40.7                                                                              |                                                                                   |                                                                                   | 40.0                                                                              |                                                                                   |                                                                                     | 8.5                                                                                 |                                                                                     |                                                                                     | 6.8                                                                                 |                                                                                     |
| Approach LOS            |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | D                                                                                 |                                                                                   |                                                                                     | A                                                                                   |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |
| Queue Length 50th (ft)  |                                                                                   | 7                                                                                 | 106                                                                               |                                                                                   | 83                                                                                | 0                                                                                 | 33                                                                                  | 125                                                                                 |                                                                                     | 2                                                                                   | 133                                                                                 |                                                                                     |
| Queue Length 95th (ft)  |                                                                                   | 23                                                                                | #207                                                                              |                                                                                   | 143                                                                               | 34                                                                                | 70                                                                                  | 162                                                                                 |                                                                                     | m2                                                                                  | m96                                                                                 |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 558                                                                               |                                                                                   |                                                                                   | 233                                                                               |                                                                                   |                                                                                    | 703                                                                                 |                                                                                     |                                                                                     | 1227                                                                                |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   | 200                                                                               |                                                                                   |                                                                                   | 200                                                                               | 550                                                                                |                                                                                     |                                                                                     | 215                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     |                                                                                   | 267                                                                               | 436                                                                               |                                                                                   | 274                                                                               | 370                                                                               | 199                                                                                | 2496                                                                                |                                                                                     | 456                                                                                 | 2292                                                                                |                                                                                     |
| Starvation Cap Reductn  |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       |                                                                                   | 0.05                                                                              | 0.72                                                                              |                                                                                   | 0.51                                                                              | 0.16                                                                              | 0.55                                                                               | 0.25                                                                                |                                                                                     | 0.06                                                                                | 0.79                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 87 (87%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 70

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.84

Intersection Signal Delay: 12.9

Intersection LOS: B

Intersection Capacity Utilization 81.3%

ICU Level of Service D

Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Trenton Dr & Centennial Rd

|                                                                                     |                                                                                     |                                                                                       |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|  |  |  |
| ø1                                                                                  | ø2                                                                                  | ø4                                                                                    |
| 12 s                                                                                | 64 s                                                                                | 24 s                                                                                  |
|  |                                                                                     |  |
| ø6                                                                                  |                                                                                     | ø8                                                                                    |
| 76 s                                                                                |                                                                                     | 24 s                                                                                  |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |                                                                                   |  |  |                                                                                   |  |  |                                                                                     |  |  |                                                                                     |
| Volume (vph)            | 25                                                                                | 34                                                                                | 220                                                                               | 909                                                                               | 376                                                                               | 49                                                                                | 148                                                                                 | 324                                                                                 | 31                                                                                  | 32                                                                                  | 1370                                                                                | 123                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 215                                                                               |                                                                                   | 0                                                                                 | 215                                                                               |                                                                                   | 0                                                                                 | 215                                                                                 |                                                                                     | 0                                                                                   | 215                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                   |                                                                                     | 0                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                  |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 35                                                                                |                                                                                   |                                                                                   | 35                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 704                                                                               |                                                                                   |                                                                                   | 799                                                                               |                                                                                   |                                                                                     | 1307                                                                                |                                                                                     |                                                                                     | 505                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 13.7                                                                              |                                                                                   |                                                                                   | 15.6                                                                              |                                                                                   |                                                                                     | 22.3                                                                                |                                                                                     |                                                                                     | 8.6                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 0%                                                                                | 0%                                                                                | 0%                                                                                | 0%                                                                                | 1%                                                                                | 3%                                                                                | 5%                                                                                  | 5%                                                                                  | 0%                                                                                  | 0%                                                                                  | 2%                                                                                  | 3%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 27                                                                                | 276                                                                               | 0                                                                                 | 988                                                                               | 462                                                                               | 0                                                                                 | 161                                                                                 | 386                                                                                 | 0                                                                                   | 35                                                                                  | 1623                                                                                | 0                                                                                   |
| Turn Type               | pm+pt                                                                             |                                                                                   |                                                                                   | pm+pt                                                                             |                                                                                   |                                                                                   | pm+pt                                                                               |                                                                                     |                                                                                     | pm+pt                                                                               |                                                                                     |                                                                                     |
| Protected Phases        | 7                                                                                 | 4                                                                                 |                                                                                   | 3                                                                                 | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   |                                                                                   | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 7                                                                                 | 4                                                                                 |                                                                                   | 3                                                                                 | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 4.0                                                                               | 10.0                                                                              |                                                                                   | 4.0                                                                               | 10.0                                                                              |                                                                                   | 4.0                                                                                 | 6.0                                                                                 |                                                                                     | 4.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 8.0                                                                               | 15.7                                                                              |                                                                                   | 8.0                                                                               | 15.7                                                                              |                                                                                   | 8.0                                                                                 | 11.5                                                                                |                                                                                     | 8.0                                                                                 | 11.5                                                                                |                                                                                     |
| Total Split (s)         | 12.0                                                                              | 17.0                                                                              | 0.0                                                                               | 36.0                                                                              | 41.0                                                                              | 0.0                                                                               | 12.0                                                                                | 35.0                                                                                | 0.0                                                                                 | 12.0                                                                                | 35.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 12.0%                                                                             | 17.0%                                                                             | 0.0%                                                                              | 36.0%                                                                             | 41.0%                                                                             | 0.0%                                                                              | 12.0%                                                                               | 35.0%                                                                               | 0.0%                                                                                | 12.0%                                                                               | 35.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.5                                                                               | 3.9                                                                               |                                                                                   | 3.5                                                                               | 3.9                                                                               |                                                                                   | 3.5                                                                                 | 3.6                                                                                 |                                                                                     | 3.5                                                                                 | 3.6                                                                                 |                                                                                     |
| All-Red Time (s)        | 0.5                                                                               | 1.8                                                                               |                                                                                   | 0.5                                                                               | 1.8                                                                               |                                                                                   | 0.5                                                                                 | 1.9                                                                                 |                                                                                     | 0.5                                                                                 | 1.9                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 5.7                                                                               | 4.0                                                                               | 4.0                                                                               | 5.7                                                                               | 4.0                                                                               | 4.0                                                                                 | 5.5                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 5.5                                                                                 | 4.0                                                                                 |
| Lead/Lag                | Lag                                                                               | Lead                                                                              |                                                                                   | Lag                                                                               | Lead                                                                              |                                                                                   | Lag                                                                                 | Lead                                                                                |                                                                                     | Lag                                                                                 | Lead                                                                                |                                                                                     |
| Lead-Lag Optimize?      | Yes                                                                               | Yes                                                                               |                                                                                   | Yes                                                                               | Yes                                                                               |                                                                                   | Yes                                                                                 | Yes                                                                                 |                                                                                     | Yes                                                                                 | Yes                                                                                 |                                                                                     |
| Recall Mode             | None                                                                              | Max                                                                               |                                                                                   | None                                                                              | Max                                                                               |                                                                                   | None                                                                                | C-Max                                                                               |                                                                                     | None                                                                                | C-Max                                                                               |                                                                                     |
| Act Effect Green (s)    | 20.0                                                                              | 11.3                                                                              |                                                                                   | 49.4                                                                              | 40.5                                                                              |                                                                                   | 40.2                                                                                | 33.9                                                                                |                                                                                     | 38.0                                                                                | 29.5                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.20                                                                              | 0.11                                                                              |                                                                                   | 0.49                                                                              | 0.40                                                                              |                                                                                   | 0.40                                                                                | 0.34                                                                                |                                                                                     | 0.38                                                                                | 0.30                                                                                |                                                                                     |
| v/c Ratio               | 0.13                                                                              | 0.87                                                                              |                                                                                   | 1.49                                                                              | 0.61                                                                              |                                                                                   | 0.78                                                                                | 0.33                                                                                |                                                                                     | 0.09                                                                                | 1.56                                                                                |                                                                                     |
| Control Delay           | 19.3                                                                              | 47.3                                                                              |                                                                                   | 257.5                                                                             | 29.1                                                                              |                                                                                   | 57.1                                                                                | 16.8                                                                                |                                                                                     | 18.1                                                                                | 286.4                                                                               |                                                                                     |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                                 | 0.0                                                                                 |                                                                                     | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |
| Total Delay             | 19.3                                                                              | 47.3                                                                              |                                                                                   | 257.5                                                                             | 29.1                                                                              |                                                                                   | 57.1                                                                                | 16.8                                                                                |                                                                                     | 18.1                                                                                | 286.4                                                                               |                                                                                     |
| LOS                     | B                                                                                 | D                                                                                 |                                                                                   | F                                                                                 | C                                                                                 |                                                                                   | E                                                                                   | B                                                                                   |                                                                                     | B                                                                                   | F                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 44.8                                                                              |                                                                                   |                                                                                   | 184.7                                                                             |                                                                                   |                                                                                     | 28.6                                                                                |                                                                                     |                                                                                     | 280.8                                                                               |                                                                                     |
| Approach LOS            |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | F                                                                                 |                                                                                   |                                                                                     | C                                                                                   |                                                                                     |                                                                                     | F                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 9                                                                                 | 81                                                                                |                                                                                   | ~839                                                                              | 247                                                                               |                                                                                   | 71                                                                                  | 48                                                                                  |                                                                                     | 13                                                                                  | ~781                                                                                |                                                                                     |
| Queue Length 95th (ft)  | 23                                                                                | #227                                                                              |                                                                                   | #1084                                                                             | 364                                                                               |                                                                                   | #169                                                                                | 68                                                                                  |                                                                                     | 31                                                                                  | #921                                                                                |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 624                                                                               |                                                                                   |                                                                                   | 719                                                                               |                                                                                   |                                                                                     | 1227                                                                                |                                                                                     |                                                                                     | 425                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 215                                                                               |                                                                                   |                                                                                   | 215                                                                               |                                                                                   |                                                                                   | 215                                                                                 |                                                                                     |                                                                                     | 215                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 232                                                                               | 318                                                                               |                                                                                   | 661                                                                               | 752                                                                               |                                                                                   | 214                                                                                 | 1160                                                                                |                                                                                     | 413                                                                                 | 1038                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.12                                                                              | 0.87                                                                              |                                                                                   | 1.49                                                                              | 0.61                                                                              |                                                                                   | 0.75                                                                                | 0.33                                                                                |                                                                                     | 0.08                                                                                | 1.56                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 92 (92%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 140

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.56

Intersection Signal Delay: 192.7

Intersection LOS: F

Intersection Capacity Utilization 131.7%

ICU Level of Service H

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 5: Century Ave & Centennial Rd

|                                                                                        |                                                                                        |                                                                                        |                                                                                          |
|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
|  ø2 |  ø1 |  ø4 |  ø3 |
| 35 s                                                                                   | 12 s                                                                                   | 17 s                                                                                   | 36 s                                                                                     |
|  ø6 |  ø5 |  ø8 |  ø7 |
| 35 s                                                                                   | 12 s                                                                                   | 41 s                                                                                   | 12 s                                                                                     |



## **Appendix M: 2024 - Signal at Trenton PM (2B2)**

Exit 161 Operational Study  
Bismarck, ND

1: Divide Ave & Bismarck Expy

|                         |  |  |  |  |  |  |   |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |                                                                                   |  |  |  |  |  |  |  |  |  |
| Volume (vph)            | 268                                                                               | 52                                                                                | 23                                                                                | 88                                                                                | 72                                                                                | 322                                                                               | 24                                                                                  | 854                                                                                 | 60                                                                                  | 233                                                                                 | 993                                                                                 | 150                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 150                                                                               |                                                                                   | 0                                                                                 | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                 |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                   |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 100                                                                               |                                                                                   | 25                                                                                | 100                                                                               |                                                                                   | 100                                                                               | 100                                                                                 |                                                                                     | 150                                                                                 | 100                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 25                                                                                |                                                                                   |                                                                                   | 25                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 371                                                                               |                                                                                   |                                                                                   | 341                                                                               |                                                                                   |                                                                                     | 614                                                                                 |                                                                                     |                                                                                     | 458                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 10.1                                                                              |                                                                                   |                                                                                   | 9.3                                                                               |                                                                                   |                                                                                     | 10.5                                                                                |                                                                                     |                                                                                     | 7.8                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 4%                                                                                | 1%                                                                                | 1%                                                                                | 11%                                                                               | 10%                                                                               | 22%                                                                               | 10%                                                                                 | 7%                                                                                  | 17%                                                                                 | 11%                                                                                 | 4%                                                                                  | 4%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 291                                                                               | 82                                                                                | 0                                                                                 | 96                                                                                | 78                                                                                | 350                                                                               | 26                                                                                  | 928                                                                                 | 65                                                                                  | 253                                                                                 | 1242                                                                                | 0                                                                                   |
| Turn Type               | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                              |                                                                                   | pm+ov                                                                             | Perm                                                                                |                                                                                     | Perm                                                                                | pm+pt                                                                               |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 | 5                                                                                 |                                                                                     | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                   |                                                                                     | 6                                                                                   | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 | 4                                                                                 |                                                                                   | 8                                                                                 | 8                                                                                 | 5                                                                                 | 6                                                                                   | 6                                                                                   | 6                                                                                   | 5                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               | 6.0                                                                               |                                                                                   | 6.0                                                                               | 6.0                                                                               | 5.0                                                                               | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 5.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 30.0                                                                              | 30.0                                                                              |                                                                                   | 30.0                                                                              | 30.0                                                                              | 9.8                                                                               | 22.9                                                                                | 22.9                                                                                | 22.9                                                                                | 9.8                                                                                 | 28.7                                                                                |                                                                                     |
| Total Split (s)         | 37.0                                                                              | 37.0                                                                              | 0.0                                                                               | 37.0                                                                              | 37.0                                                                              | 21.0                                                                              | 42.0                                                                                | 42.0                                                                                | 42.0                                                                                | 21.0                                                                                | 63.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 37.0%                                                                             | 37.0%                                                                             | 0.0%                                                                              | 37.0%                                                                             | 37.0%                                                                             | 21.0%                                                                             | 42.0%                                                                               | 42.0%                                                                               | 42.0%                                                                               | 21.0%                                                                               | 63.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 3.0                                                                               | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 | 3.0                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 1.0                                                                               | 1.8                                                                                 | 1.8                                                                                 | 1.8                                                                                 | 1.0                                                                                 | 1.8                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 5.7                                                                                 | 5.7                                                                                 | 5.7                                                                                 | 4.0                                                                                 | 5.7                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lead                                                                              | Lag                                                                                 | Lag                                                                                 | Lag                                                                                 | Lead                                                                                |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                               | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 |                                                                                     |                                                                                     |
| Recall Mode             | None                                                                              | None                                                                              |                                                                                   | None                                                                              | None                                                                              | None                                                                              | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               | None                                                                                | C-Min                                                                               |                                                                                     |
| Act Effect Green (s)    | 26.5                                                                              | 26.5                                                                              |                                                                                   | 26.5                                                                              | 26.5                                                                              | 45.5                                                                              | 44.8                                                                                | 44.8                                                                                | 44.8                                                                                | 63.5                                                                                | 61.8                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.26                                                                              | 0.26                                                                              |                                                                                   | 0.26                                                                              | 0.26                                                                              | 0.46                                                                              | 0.45                                                                                | 0.45                                                                                | 0.45                                                                                | 0.64                                                                                | 0.62                                                                                |                                                                                     |
| v/c Ratio               | 0.85                                                                              | 0.17                                                                              |                                                                                   | 0.30                                                                              | 0.17                                                                              | 0.56                                                                              | 0.15                                                                                | 0.61                                                                                | 0.10                                                                                | 0.67                                                                                | 0.59                                                                                |                                                                                     |
| Control Delay           | 57.3                                                                              | 20.2                                                                              |                                                                                   | 30.5                                                                              | 27.5                                                                              | 20.3                                                                              | 23.6                                                                                | 25.1                                                                                | 6.0                                                                                 | 24.3                                                                                | 8.0                                                                                 |                                                                                     |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.3                                                                                 |                                                                                     |
| Total Delay             | 57.3                                                                              | 20.2                                                                              |                                                                                   | 30.5                                                                              | 27.5                                                                              | 20.3                                                                              | 23.6                                                                                | 25.2                                                                                | 6.0                                                                                 | 24.3                                                                                | 8.3                                                                                 |                                                                                     |
| LOS                     | E                                                                                 | C                                                                                 |                                                                                   | C                                                                                 | C                                                                                 | C                                                                                 | C                                                                                   | C                                                                                   | A                                                                                   | C                                                                                   | A                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 49.2                                                                              |                                                                                   |                                                                                   | 23.3                                                                              |                                                                                   |                                                                                     | 23.9                                                                                |                                                                                     |                                                                                     | 11.0                                                                                |                                                                                     |
| Approach LOS            |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | C                                                                                 |                                                                                   |                                                                                     | C                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 172                                                                               | 28                                                                                |                                                                                   | 48                                                                                | 37                                                                                | 137                                                                               | 10                                                                                  | 237                                                                                 | 0                                                                                   | 51                                                                                  | 149                                                                                 |                                                                                     |
| Queue Length 95th (ft)  | #284                                                                              | 62                                                                                |                                                                                   | 89                                                                                | 71                                                                                | 193                                                                               | 33                                                                                  | 346                                                                                 | 28                                                                                  | 152                                                                                 | 188                                                                                 |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 291                                                                               |                                                                                   |                                                                                   | 261                                                                               |                                                                                   |                                                                                    | 534                                                                                 |                                                                                     |                                                                                     | 378                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 150                                                                               |                                                                                   |                                                                                   | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 400                                                                               | 572                                                                               |                                                                                   | 374                                                                               | 535                                                                               | 673                                                                               | 174                                                                                | 1511                                                                                | 654                                                                                 | 427                                                                                 | 2114                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 286                                                                                 |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 23                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.73                                                                              | 0.14                                                                              |                                                                                   | 0.26                                                                              | 0.15                                                                              | 0.52                                                                              | 0.15                                                                               | 0.62                                                                                | 0.10                                                                                | 0.59                                                                                | 0.68                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 17 (17%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.85

Intersection Signal Delay: 20.9

Intersection LOS: C

Intersection Capacity Utilization 73.2%

ICU Level of Service D

Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 1: Divide Ave & Bismarck Expy



|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |                                                                                   |  |                                                                                   |                                                                                   |                                                                                   |                                                                                    |  |  |  |  |  |
| Volume (vph)            | 318                                                                               | 0                                                                                 | 426                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 1394                                                                                | 136                                                                                 | 32                                                                                  | 654                                                                                 | 0                                                                                   |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                 | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 0                                                                                 |                                                                                   | 175                                                                               | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  |                                                                                     | 0                                                                                   | 222                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 1                                                                                 |                                                                                   | 1                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 300                                                                               | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                 |                                                                                     | 25                                                                                  | 150                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                    |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                    | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 575                                                                               |                                                                                   |                                                                                   | 383                                                                               |                                                                                   |                                                                                    | 458                                                                                 |                                                                                     |                                                                                     | 769                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 13.1                                                                              |                                                                                   |                                                                                   | 8.7                                                                               |                                                                                   |                                                                                    | 7.8                                                                                 |                                                                                     |                                                                                     | 13.1                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                               | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                               | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 3%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                 | 8%                                                                                  | 27%                                                                                 | 10%                                                                                 | 9%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 346                                                                               | 0                                                                                 | 463                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 1515                                                                                | 148                                                                                 | 35                                                                                  | 711                                                                                 | 0                                                                                   |
| Turn Type               | custom                                                                            |                                                                                   | custom                                                                            |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     | Perm                                                                                | Perm                                                                                |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     | 6                                                                                   | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                   | 6                                                                                   | 2                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               |                                                                                   | 6.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 21.1                                                                              |                                                                                   | 21.1                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 23.4                                                                                | 23.4                                                                                | 21.4                                                                                | 21.4                                                                                |                                                                                     |
| Total Split (s)         | 40.0                                                                              | 0.0                                                                               | 40.0                                                                              | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 60.0                                                                                | 60.0                                                                                | 60.0                                                                                | 60.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 40.0%                                                                             | 0.0%                                                                              | 40.0%                                                                             | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                               | 60.0%                                                                               | 60.0%                                                                               | 60.0%                                                                               | 60.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.6                                                                               |                                                                                   | 3.6                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 1.5                                                                               |                                                                                   | 1.5                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 1.5                                                                                 | 1.5                                                                                 | 1.5                                                                                 | 1.5                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 5.1                                                                               | 4.0                                                                               | 5.1                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                                | 5.4                                                                                 | 5.4                                                                                 | 5.4                                                                                 | 5.4                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Recall Mode             | None                                                                              |                                                                                   | None                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               |                                                                                     |
| Act Effct Green (s)     | 26.0                                                                              |                                                                                   | 26.0                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 63.5                                                                                | 63.5                                                                                | 63.5                                                                                | 63.5                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.26                                                                              |                                                                                   | 0.26                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.64                                                                                | 0.64                                                                                | 0.64                                                                                | 0.64                                                                                |                                                                                     |
| v/c Ratio               | 0.76                                                                              |                                                                                   | 0.83                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.71                                                                                | 0.17                                                                                | 0.30                                                                                | 0.34                                                                                |                                                                                     |
| Control Delay           | 44.5                                                                              |                                                                                   | 32.3                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 13.1                                                                                | 3.0                                                                                 | 23.1                                                                                | 13.6                                                                                |                                                                                     |
| Queue Delay             | 0.0                                                                               |                                                                                   | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.1                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |
| Total Delay             | 44.5                                                                              |                                                                                   | 32.3                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 13.2                                                                                | 3.0                                                                                 | 23.1                                                                                | 13.6                                                                                |                                                                                     |
| LOS                     | D                                                                                 |                                                                                   | C                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | B                                                                                   | A                                                                                   | C                                                                                   | B                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 12.3                                                                                |                                                                                     |                                                                                     | 14.1                                                                                |                                                                                     |
| Approach LOS            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | B                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 204                                                                               |                                                                                   | 165                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 218                                                                                 | 10                                                                                  | 19                                                                                  | 208                                                                                 |                                                                                     |
| Queue Length 95th (ft)  | 269                                                                               |                                                                                   | 260                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 260                                                                                 | m24                                                                                 | m45                                                                                 | 277                                                                                 |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 495                                                                               |                                                                                   |                                                                                   | 303                                                                               |                                                                                   |                                                                                    | 378                                                                                 |                                                                                     |                                                                                     | 689                                                                                 |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   | 175                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | 222                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 611                                                                               |                                                                                   | 681                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 2124                                                                                | 862                                                                                 | 117                                                                                 | 2104                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 51                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.57                                                                              |                                                                                   | 0.68                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.73                                                                                | 0.17                                                                                | 0.30                                                                                | 0.34                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 6 (6%), Referenced to phase 2:SBTL and 6:NBT, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.83

Intersection Signal Delay: 19.0

Intersection LOS: B

Intersection Capacity Utilization 74.4%

ICU Level of Service D

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: South Ramp & Centennial Rd

|                                                                                        |                                                                                       |
|----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|  ø2  |  ø4 |
| 60 s                                                                                   | 40 s                                                                                  |
|  ø6 |                                                                                       |
| 60 s                                                                                   |                                                                                       |

|                         |  |      |      |                                                                                   |      |                                                                                     |                                                                                     |                                                                                     |      |      |                                                                                     |      |
|-------------------------|------------------------------------------------------------------------------------|------|------|-----------------------------------------------------------------------------------|------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------|------|-------------------------------------------------------------------------------------|------|
| Lane Group              | EBL                                                                                | EBT  | EBR  | WBL                                                                               | WBT  | WBR                                                                                 | NBL                                                                                 | NBT                                                                                 | NBR  | SBL  | SBT                                                                                 | SBR  |
| Lane Configurations     |                                                                                    |      |      |  |      |  |  |  |      |      |  |      |
| Volume (vph)            | 0                                                                                  | 0    | 0    | 95                                                                                | 0    | 20                                                                                  | 462                                                                                 | 1313                                                                                | 0    | 0    | 670                                                                                 | 186  |
| Ideal Flow (vphpl)      | 1900                                                                               | 1900 | 1900 | 1900                                                                              | 1900 | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900 | 1900 | 1900                                                                                | 1900 |
| Lane Width (ft)         | 12                                                                                 | 12   | 12   | 16                                                                                | 12   | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12   | 12   | 12                                                                                  | 12   |
| Grade (%)               |                                                                                    | 0%   |      |                                                                                   | 0%   |                                                                                     |                                                                                     | 0%                                                                                  |      |      | 0%                                                                                  |      |
| Storage Length (ft)     | 0                                                                                  |      | 0    | 0                                                                                 |      | 150                                                                                 | 215                                                                                 |                                                                                     | 0    | 0    |                                                                                     | 0    |
| Storage Lanes           | 0                                                                                  |      | 0    | 1                                                                                 |      | 1                                                                                   | 1                                                                                   |                                                                                     | 0    | 0    |                                                                                     | 0    |
| Taper Length (ft)       | 25                                                                                 |      | 25   | 25                                                                                |      | 100                                                                                 | 150                                                                                 |                                                                                     | 25   | 25   |                                                                                     | 25   |
| Right Turn on Red       |                                                                                    |      | Yes  |                                                                                   |      | Yes                                                                                 |                                                                                     |                                                                                     | Yes  |      |                                                                                     | Yes  |
| Link Speed (mph)        |                                                                                    | 30   |      |                                                                                   | 30   |                                                                                     |                                                                                     | 40                                                                                  |      |      | 40                                                                                  |      |
| Link Distance (ft)      |                                                                                    | 270  |      |                                                                                   | 465  |                                                                                     |                                                                                     | 769                                                                                 |      |      | 786                                                                                 |      |
| Travel Time (s)         |                                                                                    | 6.1  |      |                                                                                   | 10.6 |                                                                                     |                                                                                     | 13.1                                                                                |      |      | 13.4                                                                                |      |
| Confl. Peds. (#/hr)     |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     |                                                                                     |      |      |                                                                                     |      |
| Confl. Bikes (#/hr)     |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     |                                                                                     |      |      |                                                                                     |      |
| Peak Hour Factor        | 0.92                                                                               | 0.92 | 0.92 | 0.92                                                                              | 0.92 | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92 | 0.92 | 0.92                                                                                | 0.92 |
| Growth Factor           | 100%                                                                               | 100% | 100% | 100%                                                                              | 100% | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100% | 100% | 100%                                                                                | 100% |
| Heavy Vehicles (%)      | 2%                                                                                 | 2%   | 2%   | 12%                                                                               | 2%   | 8%                                                                                  | 6%                                                                                  | 3%                                                                                  | 2%   | 2%   | 3%                                                                                  | 1%   |
| Bus Blockages (#/hr)    | 0                                                                                  | 0    | 0    | 0                                                                                 | 0    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0    | 0    | 0                                                                                   | 0    |
| Parking (#/hr)          |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     |                                                                                     |      |      |                                                                                     |      |
| Mid-Block Traffic (%)   |                                                                                    | 0%   |      |                                                                                   | 0%   |                                                                                     |                                                                                     | 0%                                                                                  |      |      | 0%                                                                                  |      |
| Shared Lane Traffic (%) |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     |                                                                                     |      |      |                                                                                     |      |
| Lane Group Flow (vph)   | 0                                                                                  | 0    | 0    | 103                                                                               | 0    | 22                                                                                  | 502                                                                                 | 1427                                                                                | 0    | 0    | 930                                                                                 | 0    |
| Turn Type               |                                                                                    |      |      | custom                                                                            |      | custom                                                                              | pm+pt                                                                               |                                                                                     |      |      |                                                                                     |      |
| Protected Phases        |                                                                                    |      |      |                                                                                   |      |                                                                                     | 1                                                                                   | 6                                                                                   |      |      | 2                                                                                   |      |
| Permitted Phases        |                                                                                    |      |      | 8                                                                                 |      | 8                                                                                   | 6                                                                                   |                                                                                     |      |      |                                                                                     |      |
| Detector Phase          |                                                                                    |      |      | 8                                                                                 |      | 8                                                                                   | 1                                                                                   | 6                                                                                   |      |      | 2                                                                                   |      |
| Switch Phase            |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     |                                                                                     |      |      |                                                                                     |      |
| Minimum Initial (s)     |                                                                                    |      |      | 5.0                                                                               |      | 5.0                                                                                 | 5.0                                                                                 | 10.0                                                                                |      |      | 10.0                                                                                |      |
| Minimum Split (s)       |                                                                                    |      |      | 20.0                                                                              |      | 20.0                                                                                | 9.0                                                                                 | 20.0                                                                                |      |      | 22.4                                                                                |      |
| Total Split (s)         | 0.0                                                                                | 0.0  | 0.0  | 20.0                                                                              | 0.0  | 20.0                                                                                | 38.0                                                                                | 80.0                                                                                | 0.0  | 0.0  | 42.0                                                                                | 0.0  |
| Total Split (%)         | 0.0%                                                                               | 0.0% | 0.0% | 20.0%                                                                             | 0.0% | 20.0%                                                                               | 38.0%                                                                               | 80.0%                                                                               | 0.0% | 0.0% | 42.0%                                                                               | 0.0% |
| Yellow Time (s)         |                                                                                    |      |      | 3.2                                                                               |      | 3.2                                                                                 | 3.0                                                                                 | 3.9                                                                                 |      |      | 3.9                                                                                 |      |
| All-Red Time (s)        |                                                                                    |      |      | 2.0                                                                               |      | 2.0                                                                                 | 1.0                                                                                 | 1.5                                                                                 |      |      | 1.5                                                                                 |      |
| Lost Time Adjust (s)    | 0.0                                                                                | 0.0  | 0.0  | 0.0                                                                               | 0.0  | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0  | 0.0  | 0.0                                                                                 | 0.0  |
| Total Lost Time (s)     | 4.0                                                                                | 4.0  | 4.0  | 5.2                                                                               | 4.0  | 5.2                                                                                 | 4.0                                                                                 | 5.4                                                                                 | 4.0  | 4.0  | 5.4                                                                                 | 4.0  |
| Lead/Lag                |                                                                                    |      |      |                                                                                   |      |                                                                                     | Lead                                                                                |                                                                                     |      |      | Lag                                                                                 |      |
| Lead-Lag Optimize?      |                                                                                    |      |      |                                                                                   |      |                                                                                     | Yes                                                                                 |                                                                                     |      |      | Yes                                                                                 |      |
| Recall Mode             |                                                                                    |      |      | None                                                                              |      | None                                                                                | None                                                                                | C-Min                                                                               |      |      | C-Min                                                                               |      |
| Act Effect Green (s)    |                                                                                    |      |      | 10.0                                                                              |      | 10.0                                                                                | 83.0                                                                                | 82.7                                                                                |      |      | 52.4                                                                                |      |
| Actuated g/C Ratio      |                                                                                    |      |      | 0.10                                                                              |      | 0.10                                                                                | 0.83                                                                                | 0.83                                                                                |      |      | 0.52                                                                                |      |
| v/c Ratio               |                                                                                    |      |      | 0.56                                                                              |      | 0.13                                                                                | 0.77                                                                                | 0.49                                                                                |      |      | 0.52                                                                                |      |
| Control Delay           |                                                                                    |      |      | 54.2                                                                              |      | 17.3                                                                                | 12.1                                                                                | 7.6                                                                                 |      |      | 18.9                                                                                |      |
| Queue Delay             |                                                                                    |      |      | 0.0                                                                               |      | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |      |      | 0.0                                                                                 |      |
| Total Delay             |                                                                                    |      |      | 54.2                                                                              |      | 17.3                                                                                | 12.1                                                                                | 7.6                                                                                 |      |      | 18.9                                                                                |      |
| LOS                     |                                                                                    |      |      | D                                                                                 |      | B                                                                                   | B                                                                                   | A                                                                                   |      |      | B                                                                                   |      |
| Approach Delay          |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     | 8.8                                                                                 |      |      | 18.9                                                                                |      |
| Approach LOS            |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     | A                                                                                   |      |      | B                                                                                   |      |
| Queue Length 50th (ft)  |                                                                                    |      |      | 64                                                                                |      | 0                                                                                   | 153                                                                                 | 360                                                                                 |      |      | 236                                                                                 |      |
| Queue Length 95th (ft)  |                                                                                    |      |      | 113                                                                               |      | 22                                                                                  | 167                                                                                 | 307                                                                                 |      |      | 366                                                                                 |      |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 190                                                                               |                                                                                   |                                                                                   | 385                                                                               |                                                                                   |                                                                                    | 689                                                                                 |                                                                                     |                                                                                     | 706                                                                                 |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 150                                                                               | 215                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Base Capacity (vph)     |                                                                                   |                                                                                   |                                                                                   | 270                                                                               |                                                                                   | 240                                                                               | 769                                                                                | 2898                                                                                |                                                                                     |                                                                                     | 1803                                                                                |                                                                                     |
| Starvation Cap Reductn  |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     |                                                                                     | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     |                                                                                     | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     |                                                                                     | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       |                                                                                   |                                                                                   |                                                                                   | 0.38                                                                              |                                                                                   | 0.09                                                                              | 0.65                                                                               | 0.49                                                                                |                                                                                     |                                                                                     | 0.52                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 74 (74%), Referenced to phase 2:SBT and 6:NBTL, Start of Green

Natural Cycle: 70

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.77

Intersection Signal Delay: 13.6

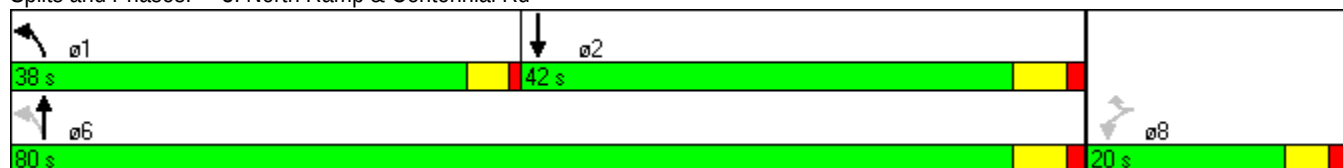
Intersection LOS: B

Intersection Capacity Utilization 74.4%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 3: North Ramp & Centennial Rd



|                         |  |  |  |  |  |  |   |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |                                                                                   |  |  |                                                                                   |  |  |  |  |                                                                                     |  |  |                                                                                     |
| Volume (vph)            | 19                                                                                | 3                                                                                 | 117                                                                               | 162                                                                               | 2                                                                                 | 102                                                                               | 184                                                                                 | 1581                                                                                | 286                                                                                 | 62                                                                                  | 749                                                                                 | 21                                                                                  |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 0                                                                                 |                                                                                   | 200                                                                               | 0                                                                                 |                                                                                   | 200                                                                               | 550                                                                                 |                                                                                     | 0                                                                                   | 215                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 0                                                                                 |                                                                                   | 1                                                                                 | 0                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                   |                                                                                     | 0                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                  |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 746                                                                               |                                                                                   |                                                                                   | 982                                                                               |                                                                                   |                                                                                     | 786                                                                                 |                                                                                     |                                                                                     | 1296                                                                                |                                                                                     |
| Travel Time (s)         |                                                                                   | 17.0                                                                              |                                                                                   |                                                                                   | 22.3                                                                              |                                                                                   |                                                                                     | 13.4                                                                                |                                                                                     |                                                                                     | 22.1                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 0                                                                                 | 24                                                                                | 127                                                                               | 0                                                                                 | 178                                                                               | 111                                                                               | 200                                                                                 | 2029                                                                                | 0                                                                                   | 67                                                                                  | 837                                                                                 | 0                                                                                   |
| Turn Type               | Perm                                                                              |                                                                                   | Perm                                                                              | Perm                                                                              |                                                                                   | Perm                                                                              | pm+pt                                                                               |                                                                                     |                                                                                     | pm+pt                                                                               |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 | 4                                                                                 | 4                                                                                 | 8                                                                                 | 8                                                                                 | 8                                                                                 | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 5.0                                                                                 | 4.0                                                                                 |                                                                                     | 5.0                                                                                 | 4.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 9.0                                                                                 | 20.0                                                                                |                                                                                     | 9.0                                                                                 | 20.0                                                                                |                                                                                     |
| Total Split (s)         | 22.0                                                                              | 22.0                                                                              | 22.0                                                                              | 22.0                                                                              | 22.0                                                                              | 22.0                                                                              | 14.0                                                                                | 64.0                                                                                | 0.0                                                                                 | 14.0                                                                                | 64.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 22.0%                                                                             | 22.0%                                                                             | 22.0%                                                                             | 22.0%                                                                             | 22.0%                                                                             | 22.0%                                                                             | 14.0%                                                                               | 64.0%                                                                               | 0.0%                                                                                | 14.0%                                                                               | 64.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               | 3.5                                                                                 | 3.5                                                                                 |                                                                                     | 3.5                                                                                 | 3.5                                                                                 |                                                                                     |
| All-Red Time (s)        | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               | 0.5                                                                                 | 0.5                                                                                 |                                                                                     | 0.5                                                                                 | 0.5                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lead                                                                                | Lag                                                                                 |                                                                                     | Lead                                                                                | Lag                                                                                 |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                                 | Yes                                                                                 |                                                                                     | Yes                                                                                 | Yes                                                                                 |                                                                                     |
| Recall Mode             | None                                                                              | None                                                                              | None                                                                              | None                                                                              | None                                                                              | None                                                                              | None                                                                                | C-Min                                                                               |                                                                                     | None                                                                                | C-Min                                                                               |                                                                                     |
| Act Effect Green (s)    |                                                                                   | 16.4                                                                              | 16.4                                                                              |                                                                                   | 16.4                                                                              | 16.4                                                                              | 74.1                                                                                | 66.8                                                                                |                                                                                     | 69.7                                                                                | 63.0                                                                                |                                                                                     |
| Actuated g/C Ratio      |                                                                                   | 0.16                                                                              | 0.16                                                                              |                                                                                   | 0.16                                                                              | 0.16                                                                              | 0.74                                                                                | 0.67                                                                                |                                                                                     | 0.70                                                                                | 0.63                                                                                |                                                                                     |
| v/c Ratio               |                                                                                   | 0.11                                                                              | 0.35                                                                              |                                                                                   | 0.82                                                                              | 0.31                                                                              | 0.40                                                                                | 0.87                                                                                |                                                                                     | 0.35                                                                                | 0.38                                                                                |                                                                                     |
| Control Delay           |                                                                                   | 35.8                                                                              | 9.4                                                                               |                                                                                   | 69.0                                                                              | 9.6                                                                               | 5.4                                                                                 | 15.6                                                                                |                                                                                     | 7.7                                                                                 | 8.8                                                                                 |                                                                                     |
| Queue Delay             |                                                                                   | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 |                                                                                     | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |
| Total Delay             |                                                                                   | 35.8                                                                              | 9.4                                                                               |                                                                                   | 69.0                                                                              | 9.6                                                                               | 5.4                                                                                 | 15.6                                                                                |                                                                                     | 7.7                                                                                 | 8.8                                                                                 |                                                                                     |
| LOS                     |                                                                                   | D                                                                                 | A                                                                                 |                                                                                   | E                                                                                 | A                                                                                 | A                                                                                   | B                                                                                   |                                                                                     | A                                                                                   | A                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 13.6                                                                              |                                                                                   |                                                                                   | 46.2                                                                              |                                                                                   |                                                                                     | 14.7                                                                                |                                                                                     |                                                                                     | 8.7                                                                                 |                                                                                     |
| Approach LOS            |                                                                                   | B                                                                                 |                                                                                   |                                                                                   | D                                                                                 |                                                                                   |                                                                                     | B                                                                                   |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |
| Queue Length 50th (ft)  |                                                                                   | 13                                                                                | 0                                                                                 |                                                                                   | 109                                                                               | 0                                                                                 | 25                                                                                  | 647                                                                                 |                                                                                     | 4                                                                                   | 150                                                                                 |                                                                                     |
| Queue Length 95th (ft)  |                                                                                   | 36                                                                                | 49                                                                                |                                                                                   | #213                                                                              | 46                                                                                | 38                                                                                  | #814                                                                                |                                                                                     | m2                                                                                  | 183                                                                                 |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 666                                                                               |                                                                                   |                                                                                   | 902                                                                               |                                                                                   |                                                                                    | 706                                                                                 |                                                                                     |                                                                                     | 1216                                                                                |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   | 200                                                                               |                                                                                   |                                                                                   | 200                                                                               | 550                                                                                |                                                                                     |                                                                                     | 215                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     |                                                                                   | 246                                                                               | 389                                                                               |                                                                                   | 238                                                                               | 376                                                                               | 516                                                                                | 2323                                                                                |                                                                                     | 251                                                                                 | 2224                                                                                |                                                                                     |
| Starvation Cap Reductn  |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       |                                                                                   | 0.10                                                                              | 0.33                                                                              |                                                                                   | 0.75                                                                              | 0.30                                                                              | 0.39                                                                               | 0.87                                                                                |                                                                                     | 0.27                                                                                | 0.38                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 36 (36%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.87

Intersection Signal Delay: 15.7

Intersection LOS: B

Intersection Capacity Utilization 82.7%

ICU Level of Service E

Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Trenton Dr & Centennial Rd

|                                                                                        |                                                                                        |                                                                                          |
|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
|  ø1 |  ø2 |  ø4 |
| 14 s                                                                                   | 64 s                                                                                   | 22 s                                                                                     |
|  ø5 |  ø6 |  ø8 |
| 14 s                                                                                   | 64 s                                                                                   | 22 s                                                                                     |

|                         |  |  |  |  |  |  |   |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |                                                                                   |  |  |                                                                                   |  |  |                                                                                     |  |  |                                                                                     |
| Volume (vph)            | 79                                                                                | 244                                                                               | 205                                                                               | 187                                                                               | 150                                                                               | 37                                                                                | 205                                                                                 | 649                                                                                 | 279                                                                                 | 55                                                                                  | 381                                                                                 | 47                                                                                  |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 215                                                                               |                                                                                   | 0                                                                                 | 215                                                                               |                                                                                   | 0                                                                                 | 215                                                                                 |                                                                                     | 0                                                                                   | 215                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                   |                                                                                     | 0                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                  |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 35                                                                                |                                                                                   |                                                                                   | 35                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 674                                                                               |                                                                                   |                                                                                   | 715                                                                               |                                                                                   |                                                                                     | 1296                                                                                |                                                                                     |                                                                                     | 473                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 13.1                                                                              |                                                                                   |                                                                                   | 13.9                                                                              |                                                                                   |                                                                                     | 22.1                                                                                |                                                                                     |                                                                                     | 8.1                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 86                                                                                | 488                                                                               | 0                                                                                 | 203                                                                               | 203                                                                               | 0                                                                                 | 223                                                                                 | 1008                                                                                | 0                                                                                   | 60                                                                                  | 465                                                                                 | 0                                                                                   |
| Turn Type               | pm+pt                                                                             |                                                                                   |                                                                                   | pm+pt                                                                             |                                                                                   |                                                                                   | pm+pt                                                                               |                                                                                     |                                                                                     | pm+pt                                                                               |                                                                                     |                                                                                     |
| Protected Phases        | 7                                                                                 | 4                                                                                 |                                                                                   | 3                                                                                 | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   |                                                                                   | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 7                                                                                 | 4                                                                                 |                                                                                   | 3                                                                                 | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 4.0                                                                               | 10.0                                                                              |                                                                                   | 4.0                                                                               | 10.0                                                                              |                                                                                   | 4.0                                                                                 | 6.0                                                                                 |                                                                                     | 4.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 8.0                                                                               | 15.7                                                                              |                                                                                   | 8.0                                                                               | 15.7                                                                              |                                                                                   | 8.0                                                                                 | 11.5                                                                                |                                                                                     | 8.0                                                                                 | 11.5                                                                                |                                                                                     |
| Total Split (s)         | 14.0                                                                              | 38.0                                                                              | 0.0                                                                               | 14.0                                                                              | 38.0                                                                              | 0.0                                                                               | 19.0                                                                                | 36.0                                                                                | 0.0                                                                                 | 12.0                                                                                | 29.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 14.0%                                                                             | 38.0%                                                                             | 0.0%                                                                              | 14.0%                                                                             | 38.0%                                                                             | 0.0%                                                                              | 19.0%                                                                               | 36.0%                                                                               | 0.0%                                                                                | 12.0%                                                                               | 29.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.5                                                                               | 3.9                                                                               |                                                                                   | 3.5                                                                               | 3.9                                                                               |                                                                                   | 3.5                                                                                 | 3.6                                                                                 |                                                                                     | 3.5                                                                                 | 3.6                                                                                 |                                                                                     |
| All-Red Time (s)        | 0.5                                                                               | 1.8                                                                               |                                                                                   | 0.5                                                                               | 1.8                                                                               |                                                                                   | 0.5                                                                                 | 1.9                                                                                 |                                                                                     | 0.5                                                                                 | 1.9                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 5.7                                                                               | 4.0                                                                               | 4.0                                                                               | 5.7                                                                               | 4.0                                                                               | 4.0                                                                                 | 5.5                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 5.5                                                                                 | 4.0                                                                                 |
| Lead/Lag                | Lead                                                                              | Lag                                                                               |                                                                                   | Lead                                                                              | Lag                                                                               |                                                                                   | Lead                                                                                | Lag                                                                                 |                                                                                     | Lead                                                                                | Lag                                                                                 |                                                                                     |
| Lead-Lag Optimize?      | Yes                                                                               | Yes                                                                               |                                                                                   | Yes                                                                               | Yes                                                                               |                                                                                   | Yes                                                                                 | Yes                                                                                 |                                                                                     | Yes                                                                                 | Yes                                                                                 |                                                                                     |
| Recall Mode             | None                                                                              | Max                                                                               |                                                                                   | None                                                                              | Max                                                                               |                                                                                   | None                                                                                | C-Max                                                                               |                                                                                     | None                                                                                | C-Max                                                                               |                                                                                     |
| Act Effect Green (s)    | 42.1                                                                              | 32.3                                                                              |                                                                                   | 45.6                                                                              | 35.9                                                                              |                                                                                   | 44.3                                                                                | 33.6                                                                                |                                                                                     | 34.6                                                                                | 26.0                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.42                                                                              | 0.32                                                                              |                                                                                   | 0.46                                                                              | 0.36                                                                              |                                                                                   | 0.44                                                                                | 0.34                                                                                |                                                                                     | 0.35                                                                                | 0.26                                                                                |                                                                                     |
| v/c Ratio               | 0.16                                                                              | 0.83                                                                              |                                                                                   | 0.68                                                                              | 0.31                                                                              |                                                                                   | 0.54                                                                                | 0.85                                                                                |                                                                                     | 0.29                                                                                | 0.51                                                                                |                                                                                     |
| Control Delay           | 15.2                                                                              | 41.8                                                                              |                                                                                   | 28.7                                                                              | 24.3                                                                              |                                                                                   | 11.0                                                                                | 24.9                                                                                |                                                                                     | 20.8                                                                                | 33.7                                                                                |                                                                                     |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                                 | 0.0                                                                                 |                                                                                     | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |
| Total Delay             | 15.2                                                                              | 41.8                                                                              |                                                                                   | 28.7                                                                              | 24.3                                                                              |                                                                                   | 11.0                                                                                | 24.9                                                                                |                                                                                     | 20.8                                                                                | 33.7                                                                                |                                                                                     |
| LOS                     | B                                                                                 | D                                                                                 |                                                                                   | C                                                                                 | C                                                                                 |                                                                                   | B                                                                                   | C                                                                                   |                                                                                     | C                                                                                   | C                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 37.8                                                                              |                                                                                   |                                                                                   | 26.5                                                                              |                                                                                   |                                                                                     | 22.4                                                                                |                                                                                     |                                                                                     | 32.2                                                                                |                                                                                     |
| Approach LOS            |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | C                                                                                 |                                                                                   |                                                                                     | C                                                                                   |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 29                                                                                | 262                                                                               |                                                                                   | 73                                                                                | 88                                                                                |                                                                                   | 54                                                                                  | 304                                                                                 |                                                                                     | 22                                                                                  | 131                                                                                 |                                                                                     |
| Queue Length 95th (ft)  | 56                                                                                | #433                                                                              |                                                                                   | #133                                                                              | 153                                                                               |                                                                                   | m58                                                                                 | m#408                                                                               |                                                                                     | 46                                                                                  | 186                                                                                 |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 594                                                                               |                                                                                   |                                                                                   | 635                                                                               |                                                                                   |                                                                                    | 1216                                                                                |                                                                                     |                                                                                     | 393                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 215                                                                               |                                                                                   |                                                                                   | 215                                                                               |                                                                                   |                                                                                   | 215                                                                                |                                                                                     |                                                                                     | 215                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 576                                                                               | 591                                                                               |                                                                                   | 302                                                                               | 658                                                                               |                                                                                   | 437                                                                                | 1181                                                                                |                                                                                     | 223                                                                                 | 913                                                                                 |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.15                                                                              | 0.83                                                                              |                                                                                   | 0.67                                                                              | 0.31                                                                              |                                                                                   | 0.51                                                                               | 0.85                                                                                |                                                                                     | 0.27                                                                                | 0.51                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 94 (94%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.85

Intersection Signal Delay: 28.1

Intersection LOS: C

Intersection Capacity Utilization 81.9%

ICU Level of Service D

Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: Century Ave & Centennial Rd

|                                                                                     |                                                                                     |                                                                                     |                                                                                      |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
|  |  |  |  |
| ø1                                                                                  | ø2                                                                                  | ø3                                                                                  | ø4                                                                                   |
| 19 s                                                                                | 29 s                                                                                | 14 s                                                                                | 38 s                                                                                 |
|  |  |  |  |
| ø5                                                                                  | ø6                                                                                  | ø7                                                                                  | ø8                                                                                   |
| 12 s                                                                                | 36 s                                                                                | 14 s                                                                                | 38 s                                                                                 |



**Appendix N: 2024 - Signal at Trenton & NE Loop Ramp AM (2C1)**

Exit 161 Operational Study  
Bismarck, ND

1: Divide Ave & Bismarck Expy

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |                                                                                   |  |  |  |  |  |  |  |  |  |
| Volume (vph)            | 106                                                                               | 114                                                                               | 16                                                                                | 110                                                                               | 75                                                                                | 258                                                                               | 25                                                                                  | 430                                                                                 | 72                                                                                  | 370                                                                                 | 1268                                                                                | 283                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 150                                                                               |                                                                                   | 0                                                                                 | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                 |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                   |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 100                                                                               |                                                                                   | 25                                                                                | 100                                                                               |                                                                                   | 100                                                                               | 100                                                                                 |                                                                                     | 150                                                                                 | 100                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 25                                                                                |                                                                                   |                                                                                   | 25                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 371                                                                               |                                                                                   |                                                                                   | 341                                                                               |                                                                                   |                                                                                     | 614                                                                                 |                                                                                     |                                                                                     | 458                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 10.1                                                                              |                                                                                   |                                                                                   | 9.3                                                                               |                                                                                   |                                                                                     | 10.5                                                                                |                                                                                     |                                                                                     | 7.8                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 13%                                                                               | 5%                                                                                | 0%                                                                                | 6%                                                                                | 17%                                                                               | 26%                                                                               | 4%                                                                                  | 9%                                                                                  | 18%                                                                                 | 2%                                                                                  | 1%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 115                                                                               | 141                                                                               | 0                                                                                 | 120                                                                               | 82                                                                                | 280                                                                               | 27                                                                                  | 467                                                                                 | 78                                                                                  | 402                                                                                 | 1686                                                                                | 0                                                                                   |
| Turn Type               | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                              |                                                                                   | pm+ov                                                                             | Perm                                                                                |                                                                                     | Perm                                                                                | pm+pt                                                                               |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 | 5                                                                                 |                                                                                     | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                   |                                                                                     | 6                                                                                   | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 | 4                                                                                 |                                                                                   | 8                                                                                 | 8                                                                                 | 5                                                                                 | 6                                                                                   | 6                                                                                   | 6                                                                                   | 5                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               | 6.0                                                                               |                                                                                   | 6.0                                                                               | 6.0                                                                               | 5.0                                                                               | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 5.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 30.0                                                                              | 30.0                                                                              |                                                                                   | 30.0                                                                              | 30.0                                                                              | 9.8                                                                               | 22.9                                                                                | 22.9                                                                                | 22.9                                                                                | 9.8                                                                                 | 28.7                                                                                |                                                                                     |
| Total Split (s)         | 30.0                                                                              | 30.0                                                                              | 0.0                                                                               | 30.0                                                                              | 30.0                                                                              | 25.4                                                                              | 44.6                                                                                | 44.6                                                                                | 44.6                                                                                | 25.4                                                                                | 70.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 30.0%                                                                             | 30.0%                                                                             | 0.0%                                                                              | 30.0%                                                                             | 30.0%                                                                             | 25.4%                                                                             | 44.6%                                                                               | 44.6%                                                                               | 44.6%                                                                               | 25.4%                                                                               | 70.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 3.0                                                                               | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 | 3.0                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 1.0                                                                               | 1.8                                                                                 | 1.8                                                                                 | 1.8                                                                                 | 1.0                                                                                 | 1.8                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 5.7                                                                                 | 5.7                                                                                 | 5.7                                                                                 | 4.0                                                                                 | 5.7                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lead                                                                              | Lag                                                                                 | Lag                                                                                 | Lag                                                                                 | Lead                                                                                |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                               | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 |                                                                                     |                                                                                     |
| Recall Mode             | None                                                                              | None                                                                              |                                                                                   | None                                                                              | None                                                                              | None                                                                              | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               | None                                                                                | C-Min                                                                               |                                                                                     |
| Act Effect Green (s)    | 15.5                                                                              | 15.5                                                                              |                                                                                   | 15.5                                                                              | 15.5                                                                              | 35.5                                                                              | 54.8                                                                                | 54.8                                                                                | 54.8                                                                                | 74.5                                                                                | 72.8                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.16                                                                              | 0.16                                                                              |                                                                                   | 0.16                                                                              | 0.16                                                                              | 0.36                                                                              | 0.55                                                                                | 0.55                                                                                | 0.55                                                                                | 0.74                                                                                | 0.73                                                                                |                                                                                     |
| v/c Ratio               | 0.63                                                                              | 0.50                                                                              |                                                                                   | 0.70                                                                              | 0.33                                                                              | 0.47                                                                              | 0.20                                                                                | 0.26                                                                                | 0.10                                                                                | 0.54                                                                                | 0.66                                                                                |                                                                                     |
| Control Delay           | 53.6                                                                              | 42.0                                                                              |                                                                                   | 60.6                                                                              | 39.3                                                                              | 6.9                                                                               | 21.3                                                                                | 14.3                                                                                | 4.4                                                                                 | 5.0                                                                                 | 4.6                                                                                 |                                                                                     |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.1                                                                                 | 0.1                                                                                 |                                                                                     |
| Total Delay             | 53.6                                                                              | 42.0                                                                              |                                                                                   | 60.6                                                                              | 39.3                                                                              | 6.9                                                                               | 21.3                                                                                | 14.3                                                                                | 4.4                                                                                 | 5.1                                                                                 | 4.7                                                                                 |                                                                                     |
| LOS                     | D                                                                                 | D                                                                                 |                                                                                   | E                                                                                 | D                                                                                 | A                                                                                 | C                                                                                   | B                                                                                   | A                                                                                   | A                                                                                   | A                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 47.2                                                                              |                                                                                   |                                                                                   | 25.8                                                                              |                                                                                   |                                                                                     | 13.2                                                                                |                                                                                     |                                                                                     | 4.8                                                                                 |                                                                                     |
| Approach LOS            |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | C                                                                                 |                                                                                   |                                                                                     | B                                                                                   |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 69                                                                                | 80                                                                                |                                                                                   | 74                                                                                | 47                                                                                | 23                                                                                | 8                                                                                   | 75                                                                                  | 0                                                                                   | 50                                                                                  | 155                                                                                 |                                                                                     |
| Queue Length 95th (ft)  | 119                                                                               | 129                                                                               |                                                                                   | 125                                                                               | 85                                                                                | 64                                                                                | 36                                                                                  | 146                                                                                 | 28                                                                                  | m82                                                                                 | 197                                                                                 |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 291                                                                               |                                                                                   |                                                                                   | 261                                                                               |                                                                                   |                                                                                    | 534                                                                                 |                                                                                     |                                                                                     | 378                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 150                                                                               |                                                                                   |                                                                                   | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 284                                                                               | 433                                                                               |                                                                                   | 265                                                                               | 390                                                                               | 679                                                                               | 136                                                                                | 1816                                                                                | 786                                                                                 | 813                                                                                 | 2543                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 30                                                                                  | 142                                                                                 |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.40                                                                              | 0.33                                                                              |                                                                                   | 0.45                                                                              | 0.21                                                                              | 0.41                                                                              | 0.20                                                                               | 0.26                                                                                | 0.10                                                                                | 0.51                                                                                | 0.70                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 67 (67%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.70

Intersection Signal Delay: 12.4

Intersection LOS: B

Intersection Capacity Utilization 81.6%

ICU Level of Service D

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Divide Ave & Bismarck Expy

|                                                                                        |                                                                                          |
|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
|  ø2  |  ø4  |
| 70 s                                                                                   | 30 s                                                                                     |
|  ø5 |  ø8 |
| 25.4 s                                                                                 | 30 s                                                                                     |
|  ø6 |                                                                                          |
| 44.6 s                                                                                 |                                                                                          |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |                                                                                   |  |                                                                                   |                                                                                   |                                                                                   |                                                                                     |  |  |  |  |  |
| Volume (vph)            | 143                                                                               | 0                                                                                 | 580                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 693                                                                                 | 101                                                                                 | 27                                                                                  | 1063                                                                                | 0                                                                                   |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 0                                                                                 |                                                                                   | 175                                                                               | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                   |                                                                                     | 0                                                                                   | 222                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 1                                                                                 |                                                                                   | 1                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                   |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 300                                                                               | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                  |                                                                                     | 25                                                                                  | 150                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 575                                                                               |                                                                                   |                                                                                   | 383                                                                               |                                                                                   |                                                                                     | 458                                                                                 |                                                                                     |                                                                                     | 769                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 13.1                                                                              |                                                                                   |                                                                                   | 8.7                                                                               |                                                                                   |                                                                                     | 7.8                                                                                 |                                                                                     |                                                                                     | 13.1                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 4%                                                                                | 0%                                                                                | 3%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 0%                                                                                  | 13%                                                                                 | 29%                                                                                 | 13%                                                                                 | 2%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 155                                                                               | 0                                                                                 | 630                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 753                                                                                 | 110                                                                                 | 29                                                                                  | 1155                                                                                | 0                                                                                   |
| Turn Type               | custom                                                                            |                                                                                   | custom                                                                            |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     | Perm                                                                                | Perm                                                                                |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     | 6                                                                                   | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 6                                                                                   | 6                                                                                   | 2                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               |                                                                                   | 6.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 21.1                                                                              |                                                                                   | 21.1                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 23.4                                                                                | 23.4                                                                                | 21.4                                                                                | 21.4                                                                                |                                                                                     |
| Total Split (s)         | 54.0                                                                              | 0.0                                                                               | 54.0                                                                              | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 46.0                                                                                | 46.0                                                                                | 46.0                                                                                | 46.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 54.0%                                                                             | 0.0%                                                                              | 54.0%                                                                             | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                                | 46.0%                                                                               | 46.0%                                                                               | 46.0%                                                                               | 46.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.6                                                                               |                                                                                   | 3.6                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 1.5                                                                               |                                                                                   | 1.5                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 1.5                                                                                 | 1.5                                                                                 | 1.5                                                                                 | 1.5                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 5.1                                                                               | 4.0                                                                               | 5.1                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                                 | 5.4                                                                                 | 5.4                                                                                 | 5.4                                                                                 | 5.4                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Recall Mode             | None                                                                              |                                                                                   | None                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               |                                                                                     |
| Act Effct Green (s)     | 44.1                                                                              |                                                                                   | 44.1                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 45.4                                                                                | 45.4                                                                                | 45.4                                                                                | 45.4                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.44                                                                              |                                                                                   | 0.44                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 0.45                                                                                | 0.45                                                                                | 0.45                                                                                | 0.45                                                                                |                                                                                     |
| v/c Ratio               | 0.20                                                                              |                                                                                   | 0.89                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 0.52                                                                                | 0.18                                                                                | 0.13                                                                                | 0.72                                                                                |                                                                                     |
| Control Delay           | 16.7                                                                              |                                                                                   | 40.8                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 19.3                                                                                | 3.6                                                                                 | 12.6                                                                                | 19.2                                                                                |                                                                                     |
| Queue Delay             | 0.0                                                                               |                                                                                   | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |
| Total Delay             | 16.7                                                                              |                                                                                   | 40.8                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 19.3                                                                                | 3.6                                                                                 | 12.6                                                                                | 19.2                                                                                |                                                                                     |
| LOS                     | B                                                                                 |                                                                                   | D                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                     | B                                                                                   | A                                                                                   | B                                                                                   | B                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 17.3                                                                                |                                                                                     |                                                                                     | 19.0                                                                                |                                                                                     |
| Approach LOS            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     | B                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 56                                                                                |                                                                                   | 333                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 205                                                                                 | 5                                                                                   | 8                                                                                   | 236                                                                                 |                                                                                     |
| Queue Length 95th (ft)  | 91                                                                                |                                                                                   | #499                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 160                                                                                 | 19                                                                                  | m12                                                                                 | 387                                                                                 |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 495                                                                               |                                                                                   |                                                                                   | 303                                                                               |                                                                                   |                                                                                    | 378                                                                                 |                                                                                     |                                                                                     | 689                                                                                 |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   | 175                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | 222                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 849                                                                               |                                                                                   | 779                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 1449                                                                                | 628                                                                                 | 217                                                                                 | 1605                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.18                                                                              |                                                                                   | 0.81                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.52                                                                                | 0.18                                                                                | 0.13                                                                                | 0.72                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 58 (58%), Referenced to phase 2:SBTL and 6:NBT, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.89

Intersection Signal Delay: 23.2

Intersection LOS: C

Intersection Capacity Utilization 74.0%

ICU Level of Service D

Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: South Ramp & Centennial Rd

|                                                                                     |                                                                                     |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|  |  |
| ø2                                                                                  | ø4                                                                                  |
| 46 s                                                                                | 54 s                                                                                |
|  |                                                                                     |
| ø6                                                                                  |                                                                                     |
| 46 s                                                                                |                                                                                     |

|                         |  |      |      |                                                                                   |      |                                                                                   |      |                                                                                     |                                                                                     |      |                                                                                     |      |
|-------------------------|------------------------------------------------------------------------------------|------|------|-----------------------------------------------------------------------------------|------|-----------------------------------------------------------------------------------|------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------|-------------------------------------------------------------------------------------|------|
| Lane Group              | EBL                                                                                | EBT  | EBR  | WBL                                                                               | WBT  | WBR                                                                               | NBL  | NBT                                                                                 | NBR                                                                                 | SBL  | SBT                                                                                 | SBR  |
| Lane Configurations     |                                                                                    |      |      |  |      |  |      |  |  |      |  |      |
| Volume (vph)            | 0                                                                                  | 0    | 0    | 87                                                                                | 0    | 9                                                                                 | 0    | 529                                                                                 | 412                                                                                 | 0    | 1700                                                                                | 380  |
| Ideal Flow (vphpl)      | 1900                                                                               | 1900 | 1900 | 1900                                                                              | 1900 | 1900                                                                              | 1900 | 1900                                                                                | 1900                                                                                | 1900 | 1900                                                                                | 1900 |
| Lane Width (ft)         | 12                                                                                 | 12   | 12   | 16                                                                                | 12   | 12                                                                                | 12   | 12                                                                                  | 12                                                                                  | 12   | 12                                                                                  | 12   |
| Grade (%)               |                                                                                    | 0%   |      |                                                                                   | 0%   |                                                                                   |      | 0%                                                                                  |                                                                                     |      | 0%                                                                                  |      |
| Storage Length (ft)     | 0                                                                                  |      | 0    | 0                                                                                 |      | 150                                                                               | 0    |                                                                                     | 215                                                                                 | 0    |                                                                                     | 0    |
| Storage Lanes           | 0                                                                                  |      | 0    | 1                                                                                 |      | 1                                                                                 | 0    |                                                                                     | 1                                                                                   | 0    |                                                                                     | 0    |
| Taper Length (ft)       | 25                                                                                 |      | 25   | 25                                                                                |      | 100                                                                               | 150  |                                                                                     | 25                                                                                  | 25   |                                                                                     | 25   |
| Right Turn on Red       |                                                                                    |      | Yes  |                                                                                   |      | Yes                                                                               |      |                                                                                     | Yes                                                                                 |      |                                                                                     | Yes  |
| Link Speed (mph)        |                                                                                    | 30   |      |                                                                                   | 30   |                                                                                   |      | 40                                                                                  |                                                                                     |      | 40                                                                                  |      |
| Link Distance (ft)      |                                                                                    | 270  |      |                                                                                   | 465  |                                                                                   |      | 769                                                                                 |                                                                                     |      | 783                                                                                 |      |
| Travel Time (s)         |                                                                                    | 6.1  |      |                                                                                   | 10.6 |                                                                                   |      | 13.1                                                                                |                                                                                     |      | 13.3                                                                                |      |
| Confl. Peds. (#/hr)     |                                                                                    |      |      |                                                                                   |      |                                                                                   |      |                                                                                     |                                                                                     |      |                                                                                     |      |
| Confl. Bikes (#/hr)     |                                                                                    |      |      |                                                                                   |      |                                                                                   |      |                                                                                     |                                                                                     |      |                                                                                     |      |
| Peak Hour Factor        | 0.92                                                                               | 0.92 | 0.92 | 0.92                                                                              | 0.92 | 0.92                                                                              | 0.92 | 0.92                                                                                | 0.92                                                                                | 0.92 | 0.92                                                                                | 0.92 |
| Growth Factor           | 100%                                                                               | 100% | 100% | 100%                                                                              | 100% | 100%                                                                              | 100% | 100%                                                                                | 100%                                                                                | 100% | 100%                                                                                | 100% |
| Heavy Vehicles (%)      | 2%                                                                                 | 2%   | 2%   | 10%                                                                               | 2%   | 33%                                                                               | 7%   | 4%                                                                                  | 2%                                                                                  | 2%   | 1%                                                                                  | 1%   |
| Bus Blockages (#/hr)    | 0                                                                                  | 0    | 0    | 0                                                                                 | 0    | 0                                                                                 | 0    | 0                                                                                   | 0                                                                                   | 0    | 0                                                                                   | 0    |
| Parking (#/hr)          |                                                                                    |      |      |                                                                                   |      |                                                                                   |      |                                                                                     |                                                                                     |      |                                                                                     |      |
| Mid-Block Traffic (%)   |                                                                                    | 0%   |      |                                                                                   | 0%   |                                                                                   |      | 0%                                                                                  |                                                                                     |      | 0%                                                                                  |      |
| Shared Lane Traffic (%) |                                                                                    |      |      |                                                                                   |      |                                                                                   |      |                                                                                     |                                                                                     |      |                                                                                     |      |
| Lane Group Flow (vph)   | 0                                                                                  | 0    | 0    | 95                                                                                | 0    | 10                                                                                | 0    | 575                                                                                 | 448                                                                                 | 0    | 2261                                                                                | 0    |
| Turn Type               |                                                                                    |      |      | custom                                                                            |      | custom                                                                            |      |                                                                                     | Free                                                                                |      |                                                                                     |      |
| Protected Phases        |                                                                                    |      |      |                                                                                   |      |                                                                                   |      | 6                                                                                   |                                                                                     |      | 2                                                                                   |      |
| Permitted Phases        |                                                                                    |      |      | 8                                                                                 |      | 8                                                                                 |      |                                                                                     | Free                                                                                |      |                                                                                     |      |
| Detector Phase          |                                                                                    |      |      | 8                                                                                 |      | 8                                                                                 |      | 6                                                                                   |                                                                                     |      | 2                                                                                   |      |
| Switch Phase            |                                                                                    |      |      |                                                                                   |      |                                                                                   |      |                                                                                     |                                                                                     |      |                                                                                     |      |
| Minimum Initial (s)     |                                                                                    |      |      | 5.0                                                                               |      | 5.0                                                                               |      | 10.0                                                                                |                                                                                     |      | 10.0                                                                                |      |
| Minimum Split (s)       |                                                                                    |      |      | 20.0                                                                              |      | 20.0                                                                              |      | 20.0                                                                                |                                                                                     |      | 22.4                                                                                |      |
| Total Split (s)         | 0.0                                                                                | 0.0  | 0.0  | 20.0                                                                              | 0.0  | 20.0                                                                              | 0.0  | 80.0                                                                                | 0.0                                                                                 | 0.0  | 80.0                                                                                | 0.0  |
| Total Split (%)         | 0.0%                                                                               | 0.0% | 0.0% | 20.0%                                                                             | 0.0% | 20.0%                                                                             | 0.0% | 80.0%                                                                               | 0.0%                                                                                | 0.0% | 80.0%                                                                               | 0.0% |
| Yellow Time (s)         |                                                                                    |      |      | 3.2                                                                               |      | 3.2                                                                               |      | 3.9                                                                                 |                                                                                     |      | 3.9                                                                                 |      |
| All-Red Time (s)        |                                                                                    |      |      | 2.0                                                                               |      | 2.0                                                                               |      | 1.5                                                                                 |                                                                                     |      | 1.5                                                                                 |      |
| Lost Time Adjust (s)    | 0.0                                                                                | 0.0  | 0.0  | 0.0                                                                               | 0.0  | 0.0                                                                               | 0.0  | 0.0                                                                                 | 0.0                                                                                 | 0.0  | 0.0                                                                                 | 0.0  |
| Total Lost Time (s)     | 4.0                                                                                | 4.0  | 4.0  | 5.2                                                                               | 4.0  | 5.2                                                                               | 4.0  | 5.4                                                                                 | 4.0                                                                                 | 4.0  | 5.4                                                                                 | 4.0  |
| Lead/Lag                |                                                                                    |      |      |                                                                                   |      |                                                                                   |      |                                                                                     |                                                                                     |      |                                                                                     |      |
| Lead-Lag Optimize?      |                                                                                    |      |      |                                                                                   |      |                                                                                   |      |                                                                                     |                                                                                     |      |                                                                                     |      |
| Recall Mode             |                                                                                    |      |      | None                                                                              |      | None                                                                              |      | C-Min                                                                               |                                                                                     |      | C-Min                                                                               |      |
| Act Effect Green (s)    |                                                                                    |      |      | 9.5                                                                               |      | 9.5                                                                               |      | 83.2                                                                                | 100.0                                                                               |      | 83.2                                                                                |      |
| Actuated g/C Ratio      |                                                                                    |      |      | 0.10                                                                              |      | 0.10                                                                              |      | 0.83                                                                                | 1.00                                                                                |      | 0.83                                                                                |      |
| v/c Ratio               |                                                                                    |      |      | 0.54                                                                              |      | 0.08                                                                              |      | 0.20                                                                                | 0.28                                                                                |      | 0.78                                                                                |      |
| Control Delay           |                                                                                    |      |      | 53.9                                                                              |      | 21.9                                                                              |      | 3.5                                                                                 | 0.4                                                                                 |      | 3.3                                                                                 |      |
| Queue Delay             |                                                                                    |      |      | 0.0                                                                               |      | 0.0                                                                               |      | 0.0                                                                                 | 0.0                                                                                 |      | 0.0                                                                                 |      |
| Total Delay             |                                                                                    |      |      | 53.9                                                                              |      | 21.9                                                                              |      | 3.5                                                                                 | 0.4                                                                                 |      | 3.3                                                                                 |      |
| LOS                     |                                                                                    |      |      | D                                                                                 |      | C                                                                                 |      | A                                                                                   | A                                                                                   |      | A                                                                                   |      |
| Approach Delay          |                                                                                    |      |      |                                                                                   |      |                                                                                   |      | 2.2                                                                                 |                                                                                     |      | 3.3                                                                                 |      |
| Approach LOS            |                                                                                    |      |      |                                                                                   |      |                                                                                   |      | A                                                                                   |                                                                                     |      | A                                                                                   |      |
| Queue Length 50th (ft)  |                                                                                    |      |      | 59                                                                                |      | 0                                                                                 |      | 23                                                                                  | 0                                                                                   |      | 7                                                                                   |      |
| Queue Length 95th (ft)  |                                                                                    |      |      | 106                                                                               |      | 15                                                                                |      | 92                                                                                  | 0                                                                                   |      | 56                                                                                  |      |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 190                                                                               |                                                                                   |                                                                                   | 385                                                                               |                                                                                   |                                                                                    | 689                                                                                 |                                                                                     |                                                                                     | 703                                                                                 |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 150                                                                               |                                                                                    |                                                                                     | 215                                                                                 |                                                                                     |                                                                                     |                                                                                     |
| Base Capacity (vph)     |                                                                                   |                                                                                   |                                                                                   | 275                                                                               |                                                                                   | 188                                                                               |                                                                                    | 2886                                                                                | 1583                                                                                |                                                                                     | 2905                                                                                |                                                                                     |
| Starvation Cap Reductn  |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                    | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                    | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                    | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       |                                                                                   |                                                                                   |                                                                                   | 0.35                                                                              |                                                                                   | 0.05                                                                              |                                                                                    | 0.20                                                                                | 0.28                                                                                |                                                                                     | 0.78                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 14 (14%), Referenced to phase 2:SBT and 6:NBT, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.78

Intersection Signal Delay: 4.5

Intersection LOS: A

Intersection Capacity Utilization 71.8%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 3: North Ramp & Centennial Rd



|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |                                                                                   |  |  |                                                                                   |  |  |  |  |  |  |  |  |
| Volume (vph)            | 10                                                                                | 2                                                                                 | 290                                                                               | 122                                                                               | 6                                                                                 | 54                                                                                | 101                                                                                 | 467                                                                                 | 110                                                                                 | 27                                                                                  | 1644                                                                                | 27                                                                                  |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 0                                                                                 |                                                                                   | 200                                                                               | 0                                                                                 |                                                                                   | 200                                                                               | 550                                                                                 |                                                                                     | 0                                                                                   | 215                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 0                                                                                 |                                                                                   | 1                                                                                 | 0                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                   |                                                                                     | 0                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                  |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 638                                                                               |                                                                                   |                                                                                   | 313                                                                               |                                                                                   |                                                                                     | 783                                                                                 |                                                                                     |                                                                                     | 1307                                                                                |                                                                                     |
| Travel Time (s)         |                                                                                   | 14.5                                                                              |                                                                                   |                                                                                   | 7.1                                                                               |                                                                                   |                                                                                     | 13.3                                                                                |                                                                                     |                                                                                     | 22.3                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 17%                                                                               | 0%                                                                                | 1%                                                                                | 1%                                                                                | 0%                                                                                | 0%                                                                                | 10%                                                                                 | 9%                                                                                  | 2%                                                                                  | 12%                                                                                 | 2%                                                                                  | 14%                                                                                 |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 0                                                                                 | 13                                                                                | 315                                                                               | 0                                                                                 | 140                                                                               | 59                                                                                | 110                                                                                 | 628                                                                                 | 0                                                                                   | 29                                                                                  | 1816                                                                                | 0                                                                                   |
| Turn Type               | Perm                                                                              |                                                                                   | Perm                                                                              | Perm                                                                              |                                                                                   | Perm                                                                              | pm+pt                                                                               |                                                                                     |                                                                                     | Perm                                                                                |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 | 4                                                                                 | 4                                                                                 | 8                                                                                 | 8                                                                                 | 8                                                                                 | 1                                                                                   | 6                                                                                   |                                                                                     | 2                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 5.0                                                                                 | 4.0                                                                                 |                                                                                     | 4.0                                                                                 | 4.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 9.0                                                                                 | 20.0                                                                                |                                                                                     | 20.0                                                                                | 20.0                                                                                |                                                                                     |
| Total Split (s)         | 24.0                                                                              | 24.0                                                                              | 24.0                                                                              | 24.0                                                                              | 24.0                                                                              | 24.0                                                                              | 12.0                                                                                | 76.0                                                                                | 0.0                                                                                 | 64.0                                                                                | 64.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 24.0%                                                                             | 24.0%                                                                             | 24.0%                                                                             | 24.0%                                                                             | 24.0%                                                                             | 24.0%                                                                             | 12.0%                                                                               | 76.0%                                                                               | 0.0%                                                                                | 64.0%                                                                               | 64.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               | 3.5                                                                                 | 3.5                                                                                 |                                                                                     | 3.5                                                                                 | 3.5                                                                                 |                                                                                     |
| All-Red Time (s)        | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               | 0.5                                                                                 | 0.5                                                                                 |                                                                                     | 0.5                                                                                 | 0.5                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lag                                                                                 |                                                                                     |                                                                                     | Lead                                                                                | Lead                                                                                |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 | Yes                                                                                 |                                                                                     |
| Recall Mode             | None                                                                              | None                                                                              | None                                                                              | None                                                                              | None                                                                              | None                                                                              | None                                                                                | C-Min                                                                               |                                                                                     | C-Min                                                                               | C-Min                                                                               |                                                                                     |
| Act Effct Green (s)     |                                                                                   | 15.9                                                                              | 15.9                                                                              |                                                                                   | 15.9                                                                              | 15.9                                                                              | 76.1                                                                                | 76.1                                                                                |                                                                                     | 65.2                                                                                | 65.2                                                                                |                                                                                     |
| Actuated g/C Ratio      |                                                                                   | 0.16                                                                              | 0.16                                                                              |                                                                                   | 0.16                                                                              | 0.16                                                                              | 0.76                                                                                | 0.76                                                                                |                                                                                     | 0.65                                                                                | 0.65                                                                                |                                                                                     |
| v/c Ratio               |                                                                                   | 0.06                                                                              | 0.84                                                                              |                                                                                   | 0.65                                                                              | 0.19                                                                              | 0.59                                                                                | 0.25                                                                                |                                                                                     | 0.06                                                                                | 0.79                                                                                |                                                                                     |
| Control Delay           |                                                                                   | 33.8                                                                              | 41.0                                                                              |                                                                                   | 52.4                                                                              | 10.7                                                                              | 47.6                                                                                | 7.5                                                                                 |                                                                                     | 2.8                                                                                 | 6.7                                                                                 |                                                                                     |
| Queue Delay             |                                                                                   | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 |                                                                                     | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |
| Total Delay             |                                                                                   | 33.8                                                                              | 41.0                                                                              |                                                                                   | 52.4                                                                              | 10.7                                                                              | 47.6                                                                                | 7.5                                                                                 |                                                                                     | 2.8                                                                                 | 6.7                                                                                 |                                                                                     |
| LOS                     |                                                                                   | C                                                                                 | D                                                                                 |                                                                                   | D                                                                                 | B                                                                                 | D                                                                                   | A                                                                                   |                                                                                     | A                                                                                   | A                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 40.7                                                                              |                                                                                   |                                                                                   | 40.0                                                                              |                                                                                   |                                                                                     | 13.5                                                                                |                                                                                     |                                                                                     | 6.7                                                                                 |                                                                                     |
| Approach LOS            |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | D                                                                                 |                                                                                   |                                                                                     | B                                                                                   |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |
| Queue Length 50th (ft)  |                                                                                   | 7                                                                                 | 106                                                                               |                                                                                   | 83                                                                                | 0                                                                                 | 30                                                                                  | 87                                                                                  |                                                                                     | 2                                                                                   | 151                                                                                 |                                                                                     |
| Queue Length 95th (ft)  |                                                                                   | 23                                                                                | #207                                                                              |                                                                                   | 143                                                                               | 34                                                                                | 83                                                                                  | 90                                                                                  |                                                                                     | m2                                                                                  | m104                                                                                |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 558                                                                               |                                                                                   |                                                                                   | 233                                                                               |                                                                                   |                                                                                    | 703                                                                                 |                                                                                     |                                                                                     | 1227                                                                                |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   | 200                                                                               |                                                                                   |                                                                                   | 200                                                                               | 550                                                                                |                                                                                     |                                                                                     | 215                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     |                                                                                   | 267                                                                               | 436                                                                               |                                                                                   | 274                                                                               | 370                                                                               | 204                                                                                | 2496                                                                                |                                                                                     | 448                                                                                 | 2301                                                                                |                                                                                     |
| Starvation Cap Reductn  |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       |                                                                                   | 0.05                                                                              | 0.72                                                                              |                                                                                   | 0.51                                                                              | 0.16                                                                              | 0.54                                                                               | 0.25                                                                                |                                                                                     | 0.06                                                                                | 0.79                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 16 (16%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 70

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.84

Intersection Signal Delay: 14.0

Intersection LOS: B

Intersection Capacity Utilization 81.3%

ICU Level of Service D

Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Trenton Dr & Centennial Rd

|                                                                                        |                                                                                         |                                                                                          |
|----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
|  ø2 |  ø1 |  ø4 |
| 64 s                                                                                   | 12 s                                                                                    | 24 s                                                                                     |
|  ø6 |                                                                                         |  ø8 |
| 76 s                                                                                   |                                                                                         | 24 s                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |                                                                                   |  |  |                                                                                   |  |  |                                                                                     |  |  |  |
| Volume (vph)            | 25                                                                                | 34                                                                                | 220                                                                               | 909                                                                               | 376                                                                               | 49                                                                                | 148                                                                                 | 324                                                                                 | 31                                                                                  | 32                                                                                  | 1370                                                                                | 123                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 215                                                                               |                                                                                   | 0                                                                                 | 215                                                                               |                                                                                   | 0                                                                                 | 215                                                                                 |                                                                                     | 0                                                                                   | 215                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                   |                                                                                     | 0                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                  |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 35                                                                                |                                                                                   |                                                                                   | 35                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 704                                                                               |                                                                                   |                                                                                   | 799                                                                               |                                                                                   |                                                                                     | 1307                                                                                |                                                                                     |                                                                                     | 505                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 13.7                                                                              |                                                                                   |                                                                                   | 15.6                                                                              |                                                                                   |                                                                                     | 22.3                                                                                |                                                                                     |                                                                                     | 8.6                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 0%                                                                                | 0%                                                                                | 0%                                                                                | 0%                                                                                | 1%                                                                                | 3%                                                                                | 5%                                                                                  | 5%                                                                                  | 0%                                                                                  | 0%                                                                                  | 2%                                                                                  | 3%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 27                                                                                | 276                                                                               | 0                                                                                 | 988                                                                               | 462                                                                               | 0                                                                                 | 161                                                                                 | 386                                                                                 | 0                                                                                   | 35                                                                                  | 1623                                                                                | 0                                                                                   |
| Turn Type               | pm+pt                                                                             |                                                                                   |                                                                                   | pm+pt                                                                             |                                                                                   |                                                                                   | pm+pt                                                                               |                                                                                     |                                                                                     | pm+pt                                                                               |                                                                                     |                                                                                     |
| Protected Phases        | 7                                                                                 | 4                                                                                 |                                                                                   | 3                                                                                 | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   |                                                                                   | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 7                                                                                 | 4                                                                                 |                                                                                   | 3                                                                                 | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 4.0                                                                               | 10.0                                                                              |                                                                                   | 4.0                                                                               | 10.0                                                                              |                                                                                   | 4.0                                                                                 | 6.0                                                                                 |                                                                                     | 4.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 8.0                                                                               | 15.7                                                                              |                                                                                   | 8.0                                                                               | 15.7                                                                              |                                                                                   | 8.0                                                                                 | 11.5                                                                                |                                                                                     | 8.0                                                                                 | 11.5                                                                                |                                                                                     |
| Total Split (s)         | 12.0                                                                              | 17.0                                                                              | 0.0                                                                               | 36.0                                                                              | 41.0                                                                              | 0.0                                                                               | 12.0                                                                                | 35.0                                                                                | 0.0                                                                                 | 12.0                                                                                | 35.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 12.0%                                                                             | 17.0%                                                                             | 0.0%                                                                              | 36.0%                                                                             | 41.0%                                                                             | 0.0%                                                                              | 12.0%                                                                               | 35.0%                                                                               | 0.0%                                                                                | 12.0%                                                                               | 35.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.5                                                                               | 3.9                                                                               |                                                                                   | 3.5                                                                               | 3.9                                                                               |                                                                                   | 3.5                                                                                 | 3.6                                                                                 |                                                                                     | 3.5                                                                                 | 3.6                                                                                 |                                                                                     |
| All-Red Time (s)        | 0.5                                                                               | 1.8                                                                               |                                                                                   | 0.5                                                                               | 1.8                                                                               |                                                                                   | 0.5                                                                                 | 1.9                                                                                 |                                                                                     | 0.5                                                                                 | 1.9                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 5.7                                                                               | 4.0                                                                               | 4.0                                                                               | 5.7                                                                               | 4.0                                                                               | 4.0                                                                                 | 5.5                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 5.5                                                                                 | 4.0                                                                                 |
| Lead/Lag                | Lag                                                                               | Lead                                                                              |                                                                                   | Lag                                                                               | Lead                                                                              |                                                                                   | Lag                                                                                 | Lag                                                                                 |                                                                                     | Lead                                                                                | Lead                                                                                |                                                                                     |
| Lead-Lag Optimize?      | Yes                                                                               | Yes                                                                               |                                                                                   | Yes                                                                               | Yes                                                                               |                                                                                   | Yes                                                                                 | Yes                                                                                 |                                                                                     | Yes                                                                                 | Yes                                                                                 |                                                                                     |
| Recall Mode             | None                                                                              | Max                                                                               |                                                                                   | None                                                                              | Max                                                                               |                                                                                   | None                                                                                | C-Max                                                                               |                                                                                     | None                                                                                | C-Max                                                                               |                                                                                     |
| Act Effect Green (s)    | 20.0                                                                              | 11.3                                                                              |                                                                                   | 49.0                                                                              | 40.1                                                                              |                                                                                   | 36.1                                                                                | 34.6                                                                                |                                                                                     | 31.0                                                                                | 29.5                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.20                                                                              | 0.11                                                                              |                                                                                   | 0.49                                                                              | 0.40                                                                              |                                                                                   | 0.36                                                                                | 0.35                                                                                |                                                                                     | 0.31                                                                                | 0.30                                                                                |                                                                                     |
| v/c Ratio               | 0.13                                                                              | 0.90                                                                              |                                                                                   | 1.51                                                                              | 0.62                                                                              |                                                                                   | 0.72                                                                                | 0.33                                                                                |                                                                                     | 0.12                                                                                | 1.56                                                                                |                                                                                     |
| Control Delay           | 19.3                                                                              | 55.4                                                                              |                                                                                   | 265.8                                                                             | 29.5                                                                              |                                                                                   | 42.2                                                                                | 13.1                                                                                |                                                                                     | 25.5                                                                                | 286.4                                                                               |                                                                                     |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                                 | 0.0                                                                                 |                                                                                     | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |
| Total Delay             | 19.3                                                                              | 55.4                                                                              |                                                                                   | 265.8                                                                             | 29.5                                                                              |                                                                                   | 42.2                                                                                | 13.1                                                                                |                                                                                     | 25.5                                                                                | 286.4                                                                               |                                                                                     |
| LOS                     | B                                                                                 | E                                                                                 |                                                                                   | F                                                                                 | C                                                                                 |                                                                                   | D                                                                                   | B                                                                                   |                                                                                     | C                                                                                   | F                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 52.2                                                                              |                                                                                   |                                                                                   | 190.5                                                                             |                                                                                   |                                                                                     | 21.7                                                                                |                                                                                     |                                                                                     | 280.9                                                                               |                                                                                     |
| Approach LOS            |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | F                                                                                 |                                                                                   |                                                                                     | C                                                                                   |                                                                                     |                                                                                     | F                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 9                                                                                 | 91                                                                                |                                                                                   | ~839                                                                              | 247                                                                               |                                                                                   | 43                                                                                  | 52                                                                                  |                                                                                     | 16                                                                                  | ~781                                                                                |                                                                                     |
| Queue Length 95th (ft)  | 23                                                                                | #244                                                                              |                                                                                   | #1084                                                                             | 364                                                                               |                                                                                   | #146                                                                                | 64                                                                                  |                                                                                     | 39                                                                                  | #921                                                                                |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 624                                                                               |                                                                                   |                                                                                   | 719                                                                               |                                                                                   |                                                                                     | 1227                                                                                |                                                                                     |                                                                                     | 425                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 215                                                                               |                                                                                   |                                                                                   | 215                                                                               |                                                                                   |                                                                                   | 215                                                                                 |                                                                                     |                                                                                     | 215                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 232                                                                               | 306                                                                               |                                                                                   | 653                                                                               | 744                                                                               |                                                                                   | 225                                                                                 | 1186                                                                                |                                                                                     | 297                                                                                 | 1038                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.12                                                                              | 0.90                                                                              |                                                                                   | 1.51                                                                              | 0.62                                                                              |                                                                                   | 0.72                                                                                | 0.33                                                                                |                                                                                     | 0.12                                                                                | 1.56                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 32 (32%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 150

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.56

Intersection Signal Delay: 194.5

Intersection LOS: F

Intersection Capacity Utilization 131.7%

ICU Level of Service H

Analysis Period (min) 15

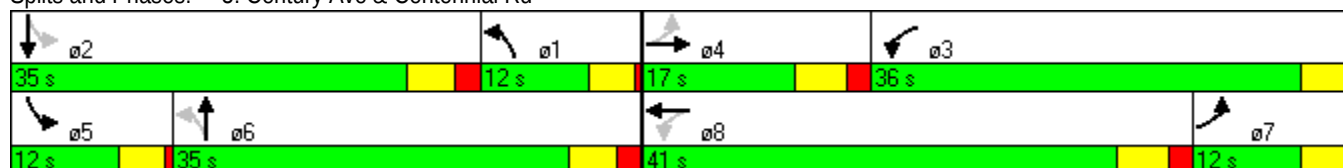
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 5: Century Ave & Centennial Rd





## **Appendix O: 2024 - Signal at Trenton & NE Loop Ramp PM (2C2)**

Exit 161 Operational Study  
Bismarck, ND

1: Divide Ave & Bismarck Expy

|                         |  |  |  |  |  |  |   |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |                                                                                   |  |  |  |  |  |  |  |  |  |
| Volume (vph)            | 268                                                                               | 52                                                                                | 23                                                                                | 88                                                                                | 72                                                                                | 322                                                                               | 24                                                                                  | 854                                                                                 | 60                                                                                  | 233                                                                                 | 993                                                                                 | 150                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 150                                                                               |                                                                                   | 0                                                                                 | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                 |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                   |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 100                                                                               |                                                                                   | 25                                                                                | 100                                                                               |                                                                                   | 100                                                                               | 100                                                                                 |                                                                                     | 150                                                                                 | 100                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 25                                                                                |                                                                                   |                                                                                   | 25                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 371                                                                               |                                                                                   |                                                                                   | 341                                                                               |                                                                                   |                                                                                     | 614                                                                                 |                                                                                     |                                                                                     | 458                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 10.1                                                                              |                                                                                   |                                                                                   | 9.3                                                                               |                                                                                   |                                                                                     | 10.5                                                                                |                                                                                     |                                                                                     | 7.8                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 4%                                                                                | 1%                                                                                | 1%                                                                                | 11%                                                                               | 10%                                                                               | 22%                                                                               | 10%                                                                                 | 7%                                                                                  | 17%                                                                                 | 11%                                                                                 | 4%                                                                                  | 4%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 291                                                                               | 82                                                                                | 0                                                                                 | 96                                                                                | 78                                                                                | 350                                                                               | 26                                                                                  | 928                                                                                 | 65                                                                                  | 253                                                                                 | 1242                                                                                | 0                                                                                   |
| Turn Type               | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                              |                                                                                   | pm+ov                                                                             | Perm                                                                                |                                                                                     | Perm                                                                                | pm+pt                                                                               |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 | 5                                                                                 |                                                                                     | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                   |                                                                                     | 6                                                                                   | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 | 4                                                                                 |                                                                                   | 8                                                                                 | 8                                                                                 | 5                                                                                 | 6                                                                                   | 6                                                                                   | 6                                                                                   | 5                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               | 6.0                                                                               |                                                                                   | 6.0                                                                               | 6.0                                                                               | 5.0                                                                               | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 5.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 30.0                                                                              | 30.0                                                                              |                                                                                   | 30.0                                                                              | 30.0                                                                              | 9.8                                                                               | 22.9                                                                                | 22.9                                                                                | 22.9                                                                                | 9.8                                                                                 | 28.7                                                                                |                                                                                     |
| Total Split (s)         | 37.0                                                                              | 37.0                                                                              | 0.0                                                                               | 37.0                                                                              | 37.0                                                                              | 21.0                                                                              | 42.0                                                                                | 42.0                                                                                | 42.0                                                                                | 21.0                                                                                | 63.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 37.0%                                                                             | 37.0%                                                                             | 0.0%                                                                              | 37.0%                                                                             | 37.0%                                                                             | 21.0%                                                                             | 42.0%                                                                               | 42.0%                                                                               | 42.0%                                                                               | 21.0%                                                                               | 63.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 3.0                                                                               | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 | 3.0                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 1.0                                                                               | 1.8                                                                                 | 1.8                                                                                 | 1.8                                                                                 | 1.0                                                                                 | 1.8                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 5.7                                                                                 | 5.7                                                                                 | 5.7                                                                                 | 4.0                                                                                 | 5.7                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lead                                                                              | Lag                                                                                 | Lag                                                                                 | Lag                                                                                 | Lead                                                                                |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                               | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 |                                                                                     |                                                                                     |
| Recall Mode             | None                                                                              | None                                                                              |                                                                                   | None                                                                              | None                                                                              | None                                                                              | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               | None                                                                                | C-Min                                                                               |                                                                                     |
| Act Effect Green (s)    | 26.5                                                                              | 26.5                                                                              |                                                                                   | 26.5                                                                              | 26.5                                                                              | 45.5                                                                              | 44.8                                                                                | 44.8                                                                                | 44.8                                                                                | 63.5                                                                                | 61.8                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.26                                                                              | 0.26                                                                              |                                                                                   | 0.26                                                                              | 0.26                                                                              | 0.46                                                                              | 0.45                                                                                | 0.45                                                                                | 0.45                                                                                | 0.64                                                                                | 0.62                                                                                |                                                                                     |
| v/c Ratio               | 0.85                                                                              | 0.17                                                                              |                                                                                   | 0.30                                                                              | 0.17                                                                              | 0.56                                                                              | 0.15                                                                                | 0.61                                                                                | 0.10                                                                                | 0.67                                                                                | 0.59                                                                                |                                                                                     |
| Control Delay           | 57.3                                                                              | 20.2                                                                              |                                                                                   | 30.5                                                                              | 27.5                                                                              | 20.3                                                                              | 23.6                                                                                | 25.1                                                                                | 6.0                                                                                 | 21.3                                                                                | 10.6                                                                                |                                                                                     |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.3                                                                                 |                                                                                     |
| Total Delay             | 57.3                                                                              | 20.2                                                                              |                                                                                   | 30.5                                                                              | 27.5                                                                              | 20.3                                                                              | 23.6                                                                                | 25.1                                                                                | 6.0                                                                                 | 21.3                                                                                | 10.9                                                                                |                                                                                     |
| LOS                     | E                                                                                 | C                                                                                 |                                                                                   | C                                                                                 | C                                                                                 | C                                                                                 | C                                                                                   | C                                                                                   | A                                                                                   | C                                                                                   | B                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 49.2                                                                              |                                                                                   |                                                                                   | 23.3                                                                              |                                                                                   |                                                                                     | 23.9                                                                                |                                                                                     |                                                                                     | 12.6                                                                                |                                                                                     |
| Approach LOS            |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | C                                                                                 |                                                                                   |                                                                                     | C                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 172                                                                               | 28                                                                                |                                                                                   | 48                                                                                | 37                                                                                | 137                                                                               | 10                                                                                  | 237                                                                                 | 0                                                                                   | 66                                                                                  | 170                                                                                 |                                                                                     |
| Queue Length 95th (ft)  | #284                                                                              | 62                                                                                |                                                                                   | 89                                                                                | 71                                                                                | 193                                                                               | 33                                                                                  | 346                                                                                 | 28                                                                                  | 146                                                                                 | 238                                                                                 |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) | 291                                                                               |                                                                                   |                                                                                   | 261                                                                               |                                                                                   |                                                                                   | 534                                                                                |                                                                                     |                                                                                     | 378                                                                                 |                                                                                     |                                                                                     |
| Turn Bay Length (ft)    | 150                                                                               |                                                                                   |                                                                                   | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 400                                                                               | 572                                                                               |                                                                                   | 374                                                                               | 535                                                                               | 673                                                                               | 174                                                                                | 1511                                                                                | 654                                                                                 | 427                                                                                 | 2114                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 286                                                                                 |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 13                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.73                                                                              | 0.14                                                                              |                                                                                   | 0.26                                                                              | 0.15                                                                              | 0.52                                                                              | 0.15                                                                               | 0.62                                                                                | 0.10                                                                                | 0.59                                                                                | 0.68                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 43 (43%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.85

Intersection Signal Delay: 21.6

Intersection LOS: C

Intersection Capacity Utilization 73.2%

ICU Level of Service D

Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 1: Divide Ave & Bismarck Expy



|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |                                                                                   |  |                                                                                   |                                                                                   |                                                                                   |                                                                                    |  |  |  |  |  |
| Volume (vph)            | 318                                                                               | 0                                                                                 | 426                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 1394                                                                                | 136                                                                                 | 32                                                                                  | 654                                                                                 | 0                                                                                   |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                 | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 0                                                                                 |                                                                                   | 175                                                                               | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  |                                                                                     | 0                                                                                   | 222                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 1                                                                                 |                                                                                   | 1                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 300                                                                               | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                 |                                                                                     | 25                                                                                  | 150                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                    |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                    | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 575                                                                               |                                                                                   |                                                                                   | 383                                                                               |                                                                                   |                                                                                    | 458                                                                                 |                                                                                     |                                                                                     | 769                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 13.1                                                                              |                                                                                   |                                                                                   | 8.7                                                                               |                                                                                   |                                                                                    | 7.8                                                                                 |                                                                                     |                                                                                     | 13.1                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                               | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                               | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 3%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                 | 8%                                                                                  | 27%                                                                                 | 10%                                                                                 | 9%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 346                                                                               | 0                                                                                 | 463                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 1515                                                                                | 148                                                                                 | 35                                                                                  | 711                                                                                 | 0                                                                                   |
| Turn Type               | custom                                                                            |                                                                                   | custom                                                                            |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     | Perm                                                                                | Perm                                                                                |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     | 6                                                                                   | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                   | 6                                                                                   | 2                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               |                                                                                   | 6.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 21.1                                                                              |                                                                                   | 21.1                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 23.4                                                                                | 23.4                                                                                | 21.4                                                                                | 21.4                                                                                |                                                                                     |
| Total Split (s)         | 40.0                                                                              | 0.0                                                                               | 40.0                                                                              | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 60.0                                                                                | 60.0                                                                                | 60.0                                                                                | 60.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 40.0%                                                                             | 0.0%                                                                              | 40.0%                                                                             | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                               | 60.0%                                                                               | 60.0%                                                                               | 60.0%                                                                               | 60.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.6                                                                               |                                                                                   | 3.6                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 1.5                                                                               |                                                                                   | 1.5                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 1.5                                                                                 | 1.5                                                                                 | 1.5                                                                                 | 1.5                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 5.1                                                                               | 4.0                                                                               | 5.1                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                                | 5.4                                                                                 | 5.4                                                                                 | 5.4                                                                                 | 5.4                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Recall Mode             | None                                                                              |                                                                                   | None                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               |                                                                                     |
| Act Effct Green (s)     | 26.0                                                                              |                                                                                   | 26.0                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 63.5                                                                                | 63.5                                                                                | 63.5                                                                                | 63.5                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.26                                                                              |                                                                                   | 0.26                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.64                                                                                | 0.64                                                                                | 0.64                                                                                | 0.64                                                                                |                                                                                     |
| v/c Ratio               | 0.76                                                                              |                                                                                   | 0.83                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.71                                                                                | 0.17                                                                                | 0.30                                                                                | 0.34                                                                                |                                                                                     |
| Control Delay           | 44.5                                                                              |                                                                                   | 32.3                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 12.9                                                                                | 2.9                                                                                 | 14.6                                                                                | 7.1                                                                                 |                                                                                     |
| Queue Delay             | 0.0                                                                               |                                                                                   | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.1                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |
| Total Delay             | 44.5                                                                              |                                                                                   | 32.3                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 13.0                                                                                | 2.9                                                                                 | 14.6                                                                                | 7.1                                                                                 |                                                                                     |
| LOS                     | D                                                                                 |                                                                                   | C                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | B                                                                                   | A                                                                                   | B                                                                                   | A                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 12.1                                                                                |                                                                                     |                                                                                     | 7.4                                                                                 |                                                                                     |
| Approach LOS            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | B                                                                                   |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 204                                                                               |                                                                                   | 165                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 223                                                                                 | 10                                                                                  | 6                                                                                   | 60                                                                                  |                                                                                     |
| Queue Length 95th (ft)  | 269                                                                               |                                                                                   | 260                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 266                                                                                 | m24                                                                                 | 24                                                                                  | 112                                                                                 |                                                                                     |

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|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 495                                                                               |                                                                                   |                                                                                   | 303                                                                               |                                                                                   |                                                                                    | 378                                                                                 |                                                                                     |                                                                                     | 689                                                                                 |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   | 175                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | 222                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 611                                                                               |                                                                                   | 681                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 2124                                                                                | 862                                                                                 | 117                                                                                 | 2104                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 51                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 |                                                                                   | 1                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 21                                                                                  |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.57                                                                              |                                                                                   | 0.68                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.73                                                                                | 0.17                                                                                | 0.30                                                                                | 0.34                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 30 (30%), Referenced to phase 2:SBTL and 6:NBT, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.83

Intersection Signal Delay: 17.4

Intersection LOS: B

Intersection Capacity Utilization 64.0%

ICU Level of Service B

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: South Ramp & Centennial Rd

|                                                                                        |                                                                                       |
|----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|  ø2  |  ø4 |
| 60 s                                                                                   | 40 s                                                                                  |
|  ø6 |                                                                                       |
| 60 s                                                                                   |                                                                                       |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |                                                                                   |                                                                                   |                                                                                   |  |                                                                                   |  |                                                                                    |  |  |                                                                                     |  |  |
| Volume (vph)            | 0                                                                                 | 0                                                                                 | 0                                                                                 | 95                                                                                | 0                                                                                 | 20                                                                                | 0                                                                                  | 1313                                                                                | 462                                                                                 | 0                                                                                   | 670                                                                                 | 186                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 16                                                                                | 12                                                                                | 12                                                                                | 12                                                                                 | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 150                                                                               | 0                                                                                  |                                                                                     | 215                                                                                 | 0                                                                                   |                                                                                     | 0                                                                                   |
| Storage Lanes           | 0                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                 |                                                                                   | 1                                                                                 | 0                                                                                  |                                                                                     | 1                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 100                                                                               | 150                                                                                |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                    |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                    | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 270                                                                               |                                                                                   |                                                                                   | 465                                                                               |                                                                                   |                                                                                    | 769                                                                                 |                                                                                     |                                                                                     | 786                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 6.1                                                                               |                                                                                   |                                                                                   | 10.6                                                                              |                                                                                   |                                                                                    | 13.1                                                                                |                                                                                     |                                                                                     | 13.4                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                               | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                               | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                | 2%                                                                                | 2%                                                                                | 12%                                                                               | 2%                                                                                | 8%                                                                                | 6%                                                                                 | 3%                                                                                  | 2%                                                                                  | 2%                                                                                  | 3%                                                                                  | 1%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 103                                                                               | 0                                                                                 | 22                                                                                | 0                                                                                  | 1427                                                                                | 502                                                                                 | 0                                                                                   | 930                                                                                 | 0                                                                                   |
| Turn Type               |                                                                                   |                                                                                   |                                                                                   | custom                                                                            |                                                                                   | custom                                                                            |                                                                                    |                                                                                     | Free                                                                                |                                                                                     |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        |                                                                                   |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 8                                                                                 |                                                                                    |                                                                                     | Free                                                                                |                                                                                     |                                                                                     |                                                                                     |
| Detector Phase          |                                                                                   |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 8                                                                                 |                                                                                    | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     |                                                                                   |                                                                                   |                                                                                   | 5.0                                                                               |                                                                                   | 5.0                                                                               |                                                                                    | 10.0                                                                                |                                                                                     |                                                                                     | 10.0                                                                                |                                                                                     |
| Minimum Split (s)       |                                                                                   |                                                                                   |                                                                                   | 20.0                                                                              |                                                                                   | 20.0                                                                              |                                                                                    | 20.0                                                                                |                                                                                     |                                                                                     | 22.4                                                                                |                                                                                     |
| Total Split (s)         | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 24.0                                                                              | 0.0                                                                               | 24.0                                                                              | 0.0                                                                                | 76.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 76.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                              | 24.0%                                                                             | 0.0%                                                                              | 24.0%                                                                             | 0.0%                                                                               | 76.0%                                                                               | 0.0%                                                                                | 0.0%                                                                                | 76.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         |                                                                                   |                                                                                   |                                                                                   | 3.2                                                                               |                                                                                   | 3.2                                                                               |                                                                                    | 3.9                                                                                 |                                                                                     |                                                                                     | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        |                                                                                   |                                                                                   |                                                                                   | 2.0                                                                               |                                                                                   | 2.0                                                                               |                                                                                    | 1.5                                                                                 |                                                                                     |                                                                                     | 1.5                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 5.2                                                                               | 4.0                                                                               | 5.2                                                                               | 4.0                                                                                | 5.4                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 5.4                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Recall Mode             |                                                                                   |                                                                                   |                                                                                   | None                                                                              |                                                                                   | None                                                                              |                                                                                    | C-Min                                                                               |                                                                                     |                                                                                     | C-Min                                                                               |                                                                                     |
| Act Effect Green (s)    |                                                                                   |                                                                                   |                                                                                   | 10.0                                                                              |                                                                                   | 10.0                                                                              |                                                                                    | 82.7                                                                                | 100.0                                                                               |                                                                                     | 82.7                                                                                |                                                                                     |
| Actuated g/C Ratio      |                                                                                   |                                                                                   |                                                                                   | 0.10                                                                              |                                                                                   | 0.10                                                                              |                                                                                    | 0.83                                                                                | 1.00                                                                                |                                                                                     | 0.83                                                                                |                                                                                     |
| v/c Ratio               |                                                                                   |                                                                                   |                                                                                   | 0.56                                                                              |                                                                                   | 0.13                                                                              |                                                                                    | 0.49                                                                                | 0.32                                                                                |                                                                                     | 0.33                                                                                |                                                                                     |
| Control Delay           |                                                                                   |                                                                                   |                                                                                   | 54.2                                                                              |                                                                                   | 17.3                                                                              |                                                                                    | 2.3                                                                                 | 0.4                                                                                 |                                                                                     | 1.6                                                                                 |                                                                                     |
| Queue Delay             |                                                                                   |                                                                                   |                                                                                   | 0.0                                                                               |                                                                                   | 0.0                                                                               |                                                                                    | 0.0                                                                                 | 0.0                                                                                 |                                                                                     | 0.0                                                                                 |                                                                                     |
| Total Delay             |                                                                                   |                                                                                   |                                                                                   | 54.2                                                                              |                                                                                   | 17.3                                                                              |                                                                                    | 2.3                                                                                 | 0.4                                                                                 |                                                                                     | 1.6                                                                                 |                                                                                     |
| LOS                     |                                                                                   |                                                                                   |                                                                                   | D                                                                                 |                                                                                   | B                                                                                 |                                                                                    | A                                                                                   | A                                                                                   |                                                                                     | A                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 1.8                                                                                 |                                                                                     |                                                                                     | 1.6                                                                                 |                                                                                     |
| Approach LOS            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | A                                                                                   |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |
| Queue Length 50th (ft)  |                                                                                   |                                                                                   |                                                                                   | 64                                                                                |                                                                                   | 0                                                                                 |                                                                                    | 65                                                                                  | 0                                                                                   |                                                                                     | 14                                                                                  |                                                                                     |
| Queue Length 95th (ft)  |                                                                                   |                                                                                   |                                                                                   | 113                                                                               |                                                                                   | 22                                                                                |                                                                                    | 47                                                                                  | 0                                                                                   |                                                                                     | 10                                                                                  |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 190                                                                               |                                                                                   |                                                                                   | 385                                                                               |                                                                                   |                                                                                    | 689                                                                                 |                                                                                     |                                                                                     | 706                                                                                 |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 150                                                                               |                                                                                    |                                                                                     | 215                                                                                 |                                                                                     |                                                                                     |                                                                                     |
| Base Capacity (vph)     |                                                                                   |                                                                                   |                                                                                   | 343                                                                               |                                                                                   | 299                                                                               |                                                                                    | 2898                                                                                | 1583                                                                                |                                                                                     | 2829                                                                                |                                                                                     |
| Starvation Cap Reductn  |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                    | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                    | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                    | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       |                                                                                   |                                                                                   |                                                                                   | 0.30                                                                              |                                                                                   | 0.07                                                                              |                                                                                    | 0.49                                                                                | 0.32                                                                                |                                                                                     | 0.33                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 49 (49%), Referenced to phase 2:SBT and 6:NBT, Start of Green

Natural Cycle: 50

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.56

Intersection Signal Delay: 3.7

Intersection LOS: A

Intersection Capacity Utilization 49.4%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 3: North Ramp & Centennial Rd



|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |                                                                                   |  |  |                                                                                   |  |  |  |  |                                                                                     |  |  |                                                                                     |
| Volume (vph)            | 19                                                                                | 3                                                                                 | 117                                                                               | 162                                                                               | 2                                                                                 | 102                                                                               | 184                                                                                 | 1581                                                                                | 286                                                                                 | 62                                                                                  | 749                                                                                 | 21                                                                                  |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 0                                                                                 |                                                                                   | 200                                                                               | 0                                                                                 |                                                                                   | 200                                                                               | 550                                                                                 |                                                                                     | 0                                                                                   | 215                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 0                                                                                 |                                                                                   | 1                                                                                 | 0                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                   |                                                                                     | 0                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                  |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 746                                                                               |                                                                                   |                                                                                   | 982                                                                               |                                                                                   |                                                                                     | 786                                                                                 |                                                                                     |                                                                                     | 1296                                                                                |                                                                                     |
| Travel Time (s)         |                                                                                   | 17.0                                                                              |                                                                                   |                                                                                   | 22.3                                                                              |                                                                                   |                                                                                     | 13.4                                                                                |                                                                                     |                                                                                     | 22.1                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 0                                                                                 | 24                                                                                | 127                                                                               | 0                                                                                 | 178                                                                               | 111                                                                               | 200                                                                                 | 2029                                                                                | 0                                                                                   | 67                                                                                  | 837                                                                                 | 0                                                                                   |
| Turn Type               | Perm                                                                              |                                                                                   | Perm                                                                              | Perm                                                                              |                                                                                   | Perm                                                                              | pm+pt                                                                               |                                                                                     |                                                                                     | pm+pt                                                                               |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 | 4                                                                                 | 4                                                                                 | 8                                                                                 | 8                                                                                 | 8                                                                                 | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 5.0                                                                                 | 4.0                                                                                 |                                                                                     | 5.0                                                                                 | 4.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 9.0                                                                                 | 20.0                                                                                |                                                                                     | 9.0                                                                                 | 20.0                                                                                |                                                                                     |
| Total Split (s)         | 22.0                                                                              | 22.0                                                                              | 22.0                                                                              | 22.0                                                                              | 22.0                                                                              | 22.0                                                                              | 14.0                                                                                | 64.0                                                                                | 0.0                                                                                 | 14.0                                                                                | 64.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 22.0%                                                                             | 22.0%                                                                             | 22.0%                                                                             | 22.0%                                                                             | 22.0%                                                                             | 22.0%                                                                             | 14.0%                                                                               | 64.0%                                                                               | 0.0%                                                                                | 14.0%                                                                               | 64.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               | 3.5                                                                                 | 3.5                                                                                 |                                                                                     | 3.5                                                                                 | 3.5                                                                                 |                                                                                     |
| All-Red Time (s)        | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               | 0.5                                                                                 | 0.5                                                                                 |                                                                                     | 0.5                                                                                 | 0.5                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lead                                                                                | Lag                                                                                 |                                                                                     | Lead                                                                                | Lag                                                                                 |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                                 | Yes                                                                                 |                                                                                     | Yes                                                                                 | Yes                                                                                 |                                                                                     |
| Recall Mode             | None                                                                              | None                                                                              | None                                                                              | None                                                                              | None                                                                              | None                                                                              | None                                                                                | C-Min                                                                               |                                                                                     | None                                                                                | C-Min                                                                               |                                                                                     |
| Act Effect Green (s)    |                                                                                   | 16.4                                                                              | 16.4                                                                              |                                                                                   | 16.4                                                                              | 16.4                                                                              | 74.1                                                                                | 66.8                                                                                |                                                                                     | 69.7                                                                                | 63.0                                                                                |                                                                                     |
| Actuated g/C Ratio      |                                                                                   | 0.16                                                                              | 0.16                                                                              |                                                                                   | 0.16                                                                              | 0.16                                                                              | 0.74                                                                                | 0.67                                                                                |                                                                                     | 0.70                                                                                | 0.63                                                                                |                                                                                     |
| v/c Ratio               |                                                                                   | 0.11                                                                              | 0.35                                                                              |                                                                                   | 0.82                                                                              | 0.31                                                                              | 0.40                                                                                | 0.87                                                                                |                                                                                     | 0.35                                                                                | 0.38                                                                                |                                                                                     |
| Control Delay           |                                                                                   | 35.8                                                                              | 9.4                                                                               |                                                                                   | 69.0                                                                              | 9.6                                                                               | 6.0                                                                                 | 15.2                                                                                |                                                                                     | 7.7                                                                                 | 8.8                                                                                 |                                                                                     |
| Queue Delay             |                                                                                   | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 |                                                                                     | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |
| Total Delay             |                                                                                   | 35.8                                                                              | 9.4                                                                               |                                                                                   | 69.0                                                                              | 9.6                                                                               | 6.0                                                                                 | 15.2                                                                                |                                                                                     | 7.7                                                                                 | 8.8                                                                                 |                                                                                     |
| LOS                     |                                                                                   | D                                                                                 | A                                                                                 |                                                                                   | E                                                                                 | A                                                                                 | A                                                                                   | B                                                                                   |                                                                                     | A                                                                                   | A                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 13.6                                                                              |                                                                                   |                                                                                   | 46.2                                                                              |                                                                                   |                                                                                     | 14.3                                                                                |                                                                                     |                                                                                     | 8.7                                                                                 |                                                                                     |
| Approach LOS            |                                                                                   | B                                                                                 |                                                                                   |                                                                                   | D                                                                                 |                                                                                   |                                                                                     | B                                                                                   |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |
| Queue Length 50th (ft)  |                                                                                   | 13                                                                                | 0                                                                                 |                                                                                   | 109                                                                               | 0                                                                                 | 20                                                                                  | 253                                                                                 |                                                                                     | 4                                                                                   | 150                                                                                 |                                                                                     |
| Queue Length 95th (ft)  |                                                                                   | 36                                                                                | 49                                                                                |                                                                                   | #213                                                                              | 46                                                                                | 57                                                                                  | #796                                                                                |                                                                                     | m2                                                                                  | 183                                                                                 |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 666                                                                               |                                                                                   |                                                                                   | 902                                                                               |                                                                                   |                                                                                     | 706                                                                                 |                                                                                     |                                                                                     | 1216                                                                                |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   | 200                                                                               |                                                                                   |                                                                                   | 200                                                                               | 550                                                                                 |                                                                                     |                                                                                     | 215                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     |                                                                                   | 246                                                                               | 389                                                                               |                                                                                   | 238                                                                               | 376                                                                               | 516                                                                                 | 2323                                                                                |                                                                                     | 251                                                                                 | 2224                                                                                |                                                                                     |
| Starvation Cap Reductn  |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       |                                                                                   | 0.10                                                                              | 0.33                                                                              |                                                                                   | 0.75                                                                              | 0.30                                                                              | 0.39                                                                                | 0.87                                                                                |                                                                                     | 0.27                                                                                | 0.38                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 32 (32%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.87

Intersection Signal Delay: 15.5

Intersection LOS: B

Intersection Capacity Utilization 82.7%

ICU Level of Service E

Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Trenton Dr & Centennial Rd

|                                                                                     |    |                                                                                     |    |                                                                                       |    |
|-------------------------------------------------------------------------------------|----|-------------------------------------------------------------------------------------|----|---------------------------------------------------------------------------------------|----|
|  | ø1 |  | ø2 |  | ø4 |
| 14 s                                                                                |    | 64 s                                                                                |    | 22 s                                                                                  |    |
|  | ø5 |  | ø6 |  | ø8 |
| 14 s                                                                                |    | 64 s                                                                                |    | 22 s                                                                                  |    |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |                                                                                   |  |  |                                                                                   |  |  |                                                                                     |  |  |  |
| Volume (vph)            | 79                                                                                | 244                                                                               | 205                                                                               | 187                                                                               | 150                                                                               | 37                                                                                | 205                                                                                 | 649                                                                                 | 279                                                                                 | 55                                                                                  | 381                                                                                 | 47                                                                                  |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 215                                                                               |                                                                                   | 0                                                                                 | 215                                                                               |                                                                                   | 0                                                                                 | 215                                                                                 |                                                                                     | 0                                                                                   | 215                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                   |                                                                                     | 0                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                  |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 35                                                                                |                                                                                   |                                                                                   | 35                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 674                                                                               |                                                                                   |                                                                                   | 715                                                                               |                                                                                   |                                                                                     | 1296                                                                                |                                                                                     |                                                                                     | 473                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 13.1                                                                              |                                                                                   |                                                                                   | 13.9                                                                              |                                                                                   |                                                                                     | 22.1                                                                                |                                                                                     |                                                                                     | 8.1                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 86                                                                                | 488                                                                               | 0                                                                                 | 203                                                                               | 203                                                                               | 0                                                                                 | 223                                                                                 | 1008                                                                                | 0                                                                                   | 60                                                                                  | 465                                                                                 | 0                                                                                   |
| Turn Type               | pm+pt                                                                             |                                                                                   |                                                                                   | pm+pt                                                                             |                                                                                   |                                                                                   | pm+pt                                                                               |                                                                                     |                                                                                     | pm+pt                                                                               |                                                                                     |                                                                                     |
| Protected Phases        | 7                                                                                 | 4                                                                                 |                                                                                   | 3                                                                                 | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   |                                                                                   | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 7                                                                                 | 4                                                                                 |                                                                                   | 3                                                                                 | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 4.0                                                                               | 10.0                                                                              |                                                                                   | 4.0                                                                               | 10.0                                                                              |                                                                                   | 4.0                                                                                 | 6.0                                                                                 |                                                                                     | 4.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 8.0                                                                               | 15.7                                                                              |                                                                                   | 8.0                                                                               | 15.7                                                                              |                                                                                   | 8.0                                                                                 | 11.5                                                                                |                                                                                     | 8.0                                                                                 | 11.5                                                                                |                                                                                     |
| Total Split (s)         | 14.0                                                                              | 38.0                                                                              | 0.0                                                                               | 14.0                                                                              | 38.0                                                                              | 0.0                                                                               | 19.0                                                                                | 36.0                                                                                | 0.0                                                                                 | 12.0                                                                                | 29.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 14.0%                                                                             | 38.0%                                                                             | 0.0%                                                                              | 14.0%                                                                             | 38.0%                                                                             | 0.0%                                                                              | 19.0%                                                                               | 36.0%                                                                               | 0.0%                                                                                | 12.0%                                                                               | 29.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.5                                                                               | 3.9                                                                               |                                                                                   | 3.5                                                                               | 3.9                                                                               |                                                                                   | 3.5                                                                                 | 3.6                                                                                 |                                                                                     | 3.5                                                                                 | 3.6                                                                                 |                                                                                     |
| All-Red Time (s)        | 0.5                                                                               | 1.8                                                                               |                                                                                   | 0.5                                                                               | 1.8                                                                               |                                                                                   | 0.5                                                                                 | 1.9                                                                                 |                                                                                     | 0.5                                                                                 | 1.9                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 5.7                                                                               | 4.0                                                                               | 4.0                                                                               | 5.7                                                                               | 4.0                                                                               | 4.0                                                                                 | 5.5                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 5.5                                                                                 | 4.0                                                                                 |
| Lead/Lag                | Lead                                                                              | Lag                                                                               |                                                                                   | Lead                                                                              | Lag                                                                               |                                                                                   | Lead                                                                                | Lag                                                                                 |                                                                                     | Lead                                                                                | Lag                                                                                 |                                                                                     |
| Lead-Lag Optimize?      | Yes                                                                               | Yes                                                                               |                                                                                   | Yes                                                                               | Yes                                                                               |                                                                                   | Yes                                                                                 | Yes                                                                                 |                                                                                     | Yes                                                                                 | Yes                                                                                 |                                                                                     |
| Recall Mode             | None                                                                              | Max                                                                               |                                                                                   | None                                                                              | Max                                                                               |                                                                                   | None                                                                                | C-Max                                                                               |                                                                                     | None                                                                                | C-Max                                                                               |                                                                                     |
| Act Effect Green (s)    | 42.1                                                                              | 32.3                                                                              |                                                                                   | 45.6                                                                              | 35.9                                                                              |                                                                                   | 44.3                                                                                | 33.6                                                                                |                                                                                     | 34.6                                                                                | 26.0                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.42                                                                              | 0.32                                                                              |                                                                                   | 0.46                                                                              | 0.36                                                                              |                                                                                   | 0.44                                                                                | 0.34                                                                                |                                                                                     | 0.35                                                                                | 0.26                                                                                |                                                                                     |
| v/c Ratio               | 0.16                                                                              | 0.83                                                                              |                                                                                   | 0.68                                                                              | 0.31                                                                              |                                                                                   | 0.54                                                                                | 0.85                                                                                |                                                                                     | 0.29                                                                                | 0.51                                                                                |                                                                                     |
| Control Delay           | 15.2                                                                              | 41.8                                                                              |                                                                                   | 28.7                                                                              | 24.3                                                                              |                                                                                   | 10.5                                                                                | 23.8                                                                                |                                                                                     | 20.8                                                                                | 33.7                                                                                |                                                                                     |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                                 | 0.0                                                                                 |                                                                                     | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |
| Total Delay             | 15.2                                                                              | 41.8                                                                              |                                                                                   | 28.7                                                                              | 24.3                                                                              |                                                                                   | 10.5                                                                                | 23.8                                                                                |                                                                                     | 20.8                                                                                | 33.7                                                                                |                                                                                     |
| LOS                     | B                                                                                 | D                                                                                 |                                                                                   | C                                                                                 | C                                                                                 |                                                                                   | B                                                                                   | C                                                                                   |                                                                                     | C                                                                                   | C                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 37.8                                                                              |                                                                                   |                                                                                   | 26.5                                                                              |                                                                                   |                                                                                     | 21.4                                                                                |                                                                                     |                                                                                     | 32.2                                                                                |                                                                                     |
| Approach LOS            |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | C                                                                                 |                                                                                   |                                                                                     | C                                                                                   |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 29                                                                                | 262                                                                               |                                                                                   | 73                                                                                | 88                                                                                |                                                                                   | 54                                                                                  | 273                                                                                 |                                                                                     | 22                                                                                  | 131                                                                                 |                                                                                     |
| Queue Length 95th (ft)  | 56                                                                                | #433                                                                              |                                                                                   | #133                                                                              | 153                                                                               |                                                                                   | m58                                                                                 | m#408                                                                               |                                                                                     | 46                                                                                  | 186                                                                                 |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 594                                                                               |                                                                                   |                                                                                   | 635                                                                               |                                                                                   |                                                                                    | 1216                                                                                |                                                                                     |                                                                                     | 393                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 215                                                                               |                                                                                   |                                                                                   | 215                                                                               |                                                                                   |                                                                                   | 215                                                                                |                                                                                     |                                                                                     | 215                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 576                                                                               | 591                                                                               |                                                                                   | 302                                                                               | 658                                                                               |                                                                                   | 437                                                                                | 1181                                                                                |                                                                                     | 223                                                                                 | 913                                                                                 |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.15                                                                              | 0.83                                                                              |                                                                                   | 0.67                                                                              | 0.31                                                                              |                                                                                   | 0.51                                                                               | 0.85                                                                                |                                                                                     | 0.27                                                                                | 0.51                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 90 (90%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.85

Intersection Signal Delay: 27.7

Intersection LOS: C

Intersection Capacity Utilization 81.9%

ICU Level of Service D

Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: Century Ave & Centennial Rd

|                                                                                        |                                                                                        |                                                                                        |                                                                                         |
|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
|  ø1 |  ø2 |  ø3 |  ø4 |
| 19 s                                                                                   | 29 s                                                                                   | 14 s                                                                                   | 38 s                                                                                    |
|  ø5 |  ø6 |  ø7 |  ø8 |
| 12 s                                                                                   | 36 s                                                                                   | 14 s                                                                                   | 38 s                                                                                    |



## **Appendix P: 2035 - Existing Control AM (3A1)**

Exit 161 Operational Study  
Bismarck, ND

1: Divide Ave & Bismarck Expy

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |                                                                                   |  |  |  |  |  |  |  |  |  |
| Volume (vph)            | 116                                                                               | 125                                                                               | 18                                                                                | 141                                                                               | 96                                                                                | 328                                                                               | 25                                                                                  | 430                                                                                 | 72                                                                                  | 428                                                                                 | 1468                                                                                | 328                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 150                                                                               |                                                                                   | 0                                                                                 | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                 |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                   |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 100                                                                               |                                                                                   | 25                                                                                | 100                                                                               |                                                                                   | 100                                                                               | 100                                                                                 |                                                                                     | 150                                                                                 | 100                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 25                                                                                |                                                                                   |                                                                                   | 25                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 371                                                                               |                                                                                   |                                                                                   | 341                                                                               |                                                                                   |                                                                                     | 614                                                                                 |                                                                                     |                                                                                     | 458                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 10.1                                                                              |                                                                                   |                                                                                   | 9.3                                                                               |                                                                                   |                                                                                     | 10.5                                                                                |                                                                                     |                                                                                     | 7.8                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 4%                                                                                | 1%                                                                                | 1%                                                                                | 11%                                                                               | 10%                                                                               | 22%                                                                               | 10%                                                                                 | 7%                                                                                  | 17%                                                                                 | 11%                                                                                 | 4%                                                                                  | 4%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 126                                                                               | 156                                                                               | 0                                                                                 | 153                                                                               | 104                                                                               | 357                                                                               | 27                                                                                  | 467                                                                                 | 78                                                                                  | 465                                                                                 | 1953                                                                                | 0                                                                                   |
| Turn Type               | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                              |                                                                                   | pm+ov                                                                             | Perm                                                                                |                                                                                     | Perm                                                                                | pm+pt                                                                               |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 | 5                                                                                 |                                                                                     | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                   |                                                                                     | 6                                                                                   | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 | 4                                                                                 |                                                                                   | 8                                                                                 | 8                                                                                 | 5                                                                                 | 6                                                                                   | 6                                                                                   | 6                                                                                   | 5                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               | 6.0                                                                               |                                                                                   | 6.0                                                                               | 6.0                                                                               | 5.0                                                                               | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 5.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 30.0                                                                              | 30.0                                                                              |                                                                                   | 30.0                                                                              | 30.0                                                                              | 9.8                                                                               | 22.9                                                                                | 22.9                                                                                | 22.9                                                                                | 9.8                                                                                 | 28.7                                                                                |                                                                                     |
| Total Split (s)         | 30.0                                                                              | 30.0                                                                              | 0.0                                                                               | 30.0                                                                              | 30.0                                                                              | 24.1                                                                              | 45.9                                                                                | 45.9                                                                                | 45.9                                                                                | 24.1                                                                                | 70.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 30.0%                                                                             | 30.0%                                                                             | 0.0%                                                                              | 30.0%                                                                             | 30.0%                                                                             | 24.1%                                                                             | 45.9%                                                                               | 45.9%                                                                               | 45.9%                                                                               | 24.1%                                                                               | 70.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 3.0                                                                               | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 | 3.0                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 1.0                                                                               | 1.8                                                                                 | 1.8                                                                                 | 1.8                                                                                 | 1.0                                                                                 | 1.8                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 5.7                                                                                 | 5.7                                                                                 | 5.7                                                                                 | 4.0                                                                                 | 5.7                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lead                                                                              | Lag                                                                                 | Lag                                                                                 | Lag                                                                                 | Lead                                                                                |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                               | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 |                                                                                     |                                                                                     |
| Recall Mode             | None                                                                              | None                                                                              |                                                                                   | None                                                                              | None                                                                              | None                                                                              | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               | None                                                                                | C-Min                                                                               |                                                                                     |
| Act Effect Green (s)    | 18.6                                                                              | 18.6                                                                              |                                                                                   | 18.6                                                                              | 18.6                                                                              | 41.3                                                                              | 49.0                                                                                | 49.0                                                                                | 49.0                                                                                | 71.4                                                                                | 69.7                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.19                                                                              | 0.19                                                                              |                                                                                   | 0.19                                                                              | 0.19                                                                              | 0.41                                                                              | 0.49                                                                                | 0.49                                                                                | 0.49                                                                                | 0.71                                                                                | 0.70                                                                                |                                                                                     |
| v/c Ratio               | 0.54                                                                              | 0.45                                                                              |                                                                                   | 0.81                                                                              | 0.32                                                                              | 0.52                                                                              | 0.39                                                                                | 0.28                                                                                | 0.11                                                                                | 0.69                                                                                | 0.82                                                                                |                                                                                     |
| Control Delay           | 44.2                                                                              | 37.3                                                                              |                                                                                   | 67.7                                                                              | 36.4                                                                              | 8.5                                                                               | 42.6                                                                                | 17.5                                                                                | 4.9                                                                                 | 10.8                                                                                | 11.1                                                                                |                                                                                     |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.5                                                                                 |                                                                                     |
| Total Delay             | 44.2                                                                              | 37.3                                                                              |                                                                                   | 67.7                                                                              | 36.4                                                                              | 8.5                                                                               | 42.6                                                                                | 17.5                                                                                | 4.9                                                                                 | 10.8                                                                                | 11.6                                                                                |                                                                                     |
| LOS                     | D                                                                                 | D                                                                                 |                                                                                   | E                                                                                 | D                                                                                 | A                                                                                 | D                                                                                   | B                                                                                   | A                                                                                   | B                                                                                   | B                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 40.4                                                                              |                                                                                   |                                                                                   | 28.0                                                                              |                                                                                   |                                                                                     | 17.0                                                                                |                                                                                     |                                                                                     | 11.5                                                                                |                                                                                     |
| Approach LOS            |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | C                                                                                 |                                                                                   |                                                                                     | B                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 72                                                                                | 84                                                                                |                                                                                   | 93                                                                                | 57                                                                                | 45                                                                                | 11                                                                                  | 94                                                                                  | 0                                                                                   | 100                                                                                 | 262                                                                                 |                                                                                     |
| Queue Length 95th (ft)  | 125                                                                               | 137                                                                               |                                                                                   | #162                                                                              | 101                                                                               | 104                                                                               | #55                                                                                 | 146                                                                                 | 28                                                                                  | 168                                                                                 | 356                                                                                 |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 291                                                                               |                                                                                   |                                                                                   | 261                                                                               |                                                                                   |                                                                                    | 534                                                                                 |                                                                                     |                                                                                     | 378                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 150                                                                               |                                                                                   |                                                                                   | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 303                                                                               | 448                                                                               |                                                                                   | 245                                                                               | 414                                                                               | 727                                                                               | 70                                                                                 | 1652                                                                                | 715                                                                                 | 702                                                                                 | 2369                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 2                                                                                   | 130                                                                                 |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.42                                                                              | 0.35                                                                              |                                                                                   | 0.62                                                                              | 0.25                                                                              | 0.49                                                                              | 0.39                                                                               | 0.28                                                                                | 0.11                                                                                | 0.66                                                                                | 0.87                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 92 (92%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.82

Intersection Signal Delay: 17.0

Intersection LOS: B

Intersection Capacity Utilization 91.0%

ICU Level of Service F

Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 1: Divide Ave & Bismarck Expy

|                                                                                        |                                                                                          |
|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
|  ø2 |  ø4 |
| 70 s                                                                                   | 30 s                                                                                     |
|  ø5 |  ø8 |
| 24.1 s                                                                                 | 30 s                                                                                     |
|  ø6 |                                                                                          |
| 45.9 s                                                                                 |                                                                                          |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |                                                                                   |  |                                                                                   |                                                                                   |                                                                                   |                                                                                    |  |  |  |  |                                                                                     |
| Volume (vph)            | 178                                                                               | 0                                                                                 | 720                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 788                                                                                 | 115                                                                                 | 30                                                                                  | 1178                                                                                | 0                                                                                   |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                 | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 200                                                                               |                                                                                   | 200                                                                               | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  |                                                                                     | 0                                                                                   | 222                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 2                                                                                 |                                                                                   | 2                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 300                                                                               | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                 |                                                                                     | 25                                                                                  | 150                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                    |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                    | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 575                                                                               |                                                                                   |                                                                                   | 383                                                                               |                                                                                   |                                                                                    | 458                                                                                 |                                                                                     |                                                                                     | 769                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 13.1                                                                              |                                                                                   |                                                                                   | 8.7                                                                               |                                                                                   |                                                                                    | 7.8                                                                                 |                                                                                     |                                                                                     | 13.1                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                               | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                               | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 3%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                 | 8%                                                                                  | 27%                                                                                 | 10%                                                                                 | 9%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 193                                                                               | 0                                                                                 | 783                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 857                                                                                 | 125                                                                                 | 33                                                                                  | 1280                                                                                | 0                                                                                   |
| Turn Type               | custom                                                                            |                                                                                   | custom                                                                            |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     | Perm                                                                                | Perm                                                                                |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     | 6                                                                                   | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                   | 6                                                                                   | 2                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               |                                                                                   | 6.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 21.1                                                                              |                                                                                   | 21.1                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 23.4                                                                                | 23.4                                                                                | 21.4                                                                                | 21.4                                                                                |                                                                                     |
| Total Split (s)         | 42.0                                                                              | 0.0                                                                               | 42.0                                                                              | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 58.0                                                                                | 58.0                                                                                | 58.0                                                                                | 58.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 42.0%                                                                             | 0.0%                                                                              | 42.0%                                                                             | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                               | 58.0%                                                                               | 58.0%                                                                               | 58.0%                                                                               | 58.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.6                                                                               |                                                                                   | 3.6                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 1.5                                                                               |                                                                                   | 1.5                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 1.5                                                                                 | 1.5                                                                                 | 1.5                                                                                 | 1.5                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 5.1                                                                               | 4.0                                                                               | 5.1                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                                | 5.4                                                                                 | 5.4                                                                                 | 5.4                                                                                 | 5.4                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Recall Mode             | None                                                                              |                                                                                   | None                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               |                                                                                     |
| Act Effect Green (s)    | 31.5                                                                              |                                                                                   | 31.5                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 58.0                                                                                | 58.0                                                                                | 58.0                                                                                | 58.0                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.32                                                                              |                                                                                   | 0.32                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.58                                                                                | 0.58                                                                                | 0.58                                                                                | 0.58                                                                                |                                                                                     |
| v/c Ratio               | 0.18                                                                              |                                                                                   | 0.84                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.44                                                                                | 0.16                                                                                | 0.12                                                                                | 0.67                                                                                |                                                                                     |
| Control Delay           | 24.2                                                                              |                                                                                   | 37.6                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 12.1                                                                                | 3.4                                                                                 | 2.6                                                                                 | 5.0                                                                                 |                                                                                     |
| Queue Delay             | 0.0                                                                               |                                                                                   | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.1                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.2                                                                                 |                                                                                     |
| Total Delay             | 24.2                                                                              |                                                                                   | 37.6                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 12.2                                                                                | 3.4                                                                                 | 2.6                                                                                 | 5.3                                                                                 |                                                                                     |
| LOS                     | C                                                                                 |                                                                                   | D                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | B                                                                                   | A                                                                                   | A                                                                                   | A                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 11.1                                                                                |                                                                                     |                                                                                     | 5.2                                                                                 |                                                                                     |
| Approach LOS            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | B                                                                                   |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 45                                                                                |                                                                                   | 238                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 127                                                                                 | 5                                                                                   | 2                                                                                   | 76                                                                                  |                                                                                     |
| Queue Length 95th (ft)  | 66                                                                                |                                                                                   | 298                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 173                                                                                 | 21                                                                                  | m3                                                                                  | m150                                                                                |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 495                                                                               |                                                                                   |                                                                                   | 303                                                                               |                                                                                   |                                                                                    | 378                                                                                 |                                                                                     |                                                                                     | 689                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 200                                                                               |                                                                                   | 200                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | 222                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 1255                                                                              |                                                                                   | 1074                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 1938                                                                                | 790                                                                                 | 281                                                                                 | 1920                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 310                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 |                                                                                   | 3                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 143                                                                                 |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.15                                                                              |                                                                                   | 0.73                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.53                                                                                | 0.16                                                                                | 0.12                                                                                | 0.72                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 78 (78%), Referenced to phase 2:SBTL and 6:NBT, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.84

Intersection Signal Delay: 15.9

Intersection LOS: B

Intersection Capacity Utilization 101.8%

ICU Level of Service G

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: South Ramp & Centennial Rd

|                                                                                        |                                                                                       |
|----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|  ø2  |  ø4 |
| 58 s                                                                                   | 42 s                                                                                  |
|  ø6 |                                                                                       |
| 58 s                                                                                   |                                                                                       |

|                         |  |      |      |                                                                                   |      |                                                                                     |                                                                                     |                                                                                     |      |      |                                                                                     |                                                                                     |
|-------------------------|------------------------------------------------------------------------------------|------|------|-----------------------------------------------------------------------------------|------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------|------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                                | EBT  | EBR  | WBL                                                                               | WBT  | WBR                                                                                 | NBL                                                                                 | NBT                                                                                 | NBR  | SBL  | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |                                                                                    |      |      |  |      |  |  |  |      |      |  |  |
| Volume (vph)            | 0                                                                                  | 0    | 0    | 175                                                                               | 0    | 17                                                                                  | 471                                                                                 | 605                                                                                 | 0    | 0    | 1949                                                                                | 435                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                               | 1900 | 1900 | 1900                                                                              | 1900 | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900 | 1900 | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                 | 12   | 12   | 16                                                                                | 12   | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12   | 12   | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                    | 0%   |      |                                                                                   | 0%   |                                                                                     |                                                                                     | 0%                                                                                  |      |      | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 0                                                                                  |      | 0    | 0                                                                                 |      | 150                                                                                 | 215                                                                                 |                                                                                     | 0    | 0    |                                                                                     | 200                                                                                 |
| Storage Lanes           | 0                                                                                  |      | 0    | 1                                                                                 |      | 1                                                                                   | 1                                                                                   |                                                                                     | 0    | 0    |                                                                                     | 1                                                                                   |
| Taper Length (ft)       | 25                                                                                 |      | 25   | 25                                                                                |      | 100                                                                                 | 150                                                                                 |                                                                                     | 25   | 25   |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                    |      | Yes  |                                                                                   |      | Yes                                                                                 |                                                                                     |                                                                                     | Yes  |      |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                    | 30   |      |                                                                                   | 30   |                                                                                     |                                                                                     | 40                                                                                  |      |      | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                    | 270  |      |                                                                                   | 465  |                                                                                     |                                                                                     | 769                                                                                 |      |      | 790                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                    | 6.1  |      |                                                                                   | 10.6 |                                                                                     |                                                                                     | 13.1                                                                                |      |      | 13.5                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     |                                                                                     |      |      |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     |                                                                                     |      |      |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                               | 0.92 | 0.92 | 0.92                                                                              | 0.92 | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92 | 0.92 | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                               | 100% | 100% | 100%                                                                              | 100% | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100% | 100% | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                 | 2%   | 2%   | 12%                                                                               | 2%   | 8%                                                                                  | 6%                                                                                  | 3%                                                                                  | 2%   | 2%   | 3%                                                                                  | 1%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                  | 0    | 0    | 0                                                                                 | 0    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0    | 0    | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     |                                                                                     |      |      |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                    | 0%   |      |                                                                                   | 0%   |                                                                                     |                                                                                     | 0%                                                                                  |      |      | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     |                                                                                     |      |      |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 0                                                                                  | 0    | 0    | 190                                                                               | 0    | 18                                                                                  | 512                                                                                 | 658                                                                                 | 0    | 0    | 2118                                                                                | 473                                                                                 |
| Turn Type               |                                                                                    |      |      | custom                                                                            |      | custom                                                                              | pm+pt                                                                               |                                                                                     |      |      |                                                                                     | Perm                                                                                |
| Protected Phases        |                                                                                    |      |      |                                                                                   |      |                                                                                     | 1                                                                                   | 6                                                                                   |      |      | 2                                                                                   |                                                                                     |
| Permitted Phases        |                                                                                    |      |      | 8                                                                                 |      | 8                                                                                   | 6                                                                                   |                                                                                     |      |      |                                                                                     | 2                                                                                   |
| Detector Phase          |                                                                                    |      |      | 8                                                                                 |      | 8                                                                                   | 1                                                                                   | 6                                                                                   |      |      | 2                                                                                   | 2                                                                                   |
| Switch Phase            |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     |                                                                                     |      |      |                                                                                     |                                                                                     |
| Minimum Initial (s)     |                                                                                    |      |      | 5.0                                                                               |      | 5.0                                                                                 | 5.0                                                                                 | 10.0                                                                                |      |      | 10.0                                                                                | 10.0                                                                                |
| Minimum Split (s)       |                                                                                    |      |      | 20.0                                                                              |      | 20.0                                                                                | 9.0                                                                                 | 20.0                                                                                |      |      | 22.4                                                                                | 22.4                                                                                |
| Total Split (s)         | 0.0                                                                                | 0.0  | 0.0  | 20.0                                                                              | 0.0  | 20.0                                                                                | 23.0                                                                                | 80.0                                                                                | 0.0  | 0.0  | 57.0                                                                                | 57.0                                                                                |
| Total Split (%)         | 0.0%                                                                               | 0.0% | 0.0% | 20.0%                                                                             | 0.0% | 20.0%                                                                               | 23.0%                                                                               | 80.0%                                                                               | 0.0% | 0.0% | 57.0%                                                                               | 57.0%                                                                               |
| Yellow Time (s)         |                                                                                    |      |      | 3.2                                                                               |      | 3.2                                                                                 | 3.0                                                                                 | 3.9                                                                                 |      |      | 3.9                                                                                 | 3.9                                                                                 |
| All-Red Time (s)        |                                                                                    |      |      | 2.0                                                                               |      | 2.0                                                                                 | 1.0                                                                                 | 1.5                                                                                 |      |      | 1.5                                                                                 | 1.5                                                                                 |
| Lost Time Adjust (s)    | 0.0                                                                                | 0.0  | 0.0  | 0.0                                                                               | 0.0  | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0  | 0.0  | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                                | 4.0  | 4.0  | 5.2                                                                               | 4.0  | 5.2                                                                                 | 4.0                                                                                 | 5.4                                                                                 | 4.0  | 4.0  | 5.4                                                                                 | 5.4                                                                                 |
| Lead/Lag                |                                                                                    |      |      |                                                                                   |      |                                                                                     | Lag                                                                                 |                                                                                     |      |      | Lead                                                                                | Lead                                                                                |
| Lead-Lag Optimize?      |                                                                                    |      |      |                                                                                   |      |                                                                                     | Yes                                                                                 |                                                                                     |      |      | Yes                                                                                 | Yes                                                                                 |
| Recall Mode             |                                                                                    |      |      | None                                                                              |      | None                                                                                | None                                                                                | C-Min                                                                               |      |      | C-Min                                                                               | C-Min                                                                               |
| Act Effect Green (s)    |                                                                                    |      |      | 13.3                                                                              |      | 13.3                                                                                | 77.5                                                                                | 76.1                                                                                |      |      | 53.1                                                                                | 53.1                                                                                |
| Actuated g/C Ratio      |                                                                                    |      |      | 0.13                                                                              |      | 0.13                                                                                | 0.78                                                                                | 0.76                                                                                |      |      | 0.53                                                                                | 0.53                                                                                |
| v/c Ratio               |                                                                                    |      |      | 0.79                                                                              |      | 0.08                                                                                | 1.30                                                                                | 0.25                                                                                |      |      | 1.14                                                                                | 0.48                                                                                |
| Control Delay           |                                                                                    |      |      | 64.2                                                                              |      | 16.9                                                                                | 177.2                                                                               | 2.8                                                                                 |      |      | 87.3                                                                                | 4.9                                                                                 |
| Queue Delay             |                                                                                    |      |      | 0.0                                                                               |      | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |      |      | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             |                                                                                    |      |      | 64.2                                                                              |      | 16.9                                                                                | 177.2                                                                               | 2.8                                                                                 |      |      | 87.3                                                                                | 4.9                                                                                 |
| LOS                     |                                                                                    |      |      | E                                                                                 |      | B                                                                                   | F                                                                                   | A                                                                                   |      |      | F                                                                                   | A                                                                                   |
| Approach Delay          |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     | 79.1                                                                                |      |      | 72.3                                                                                |                                                                                     |
| Approach LOS            |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     | E                                                                                   |      |      | E                                                                                   |                                                                                     |
| Queue Length 50th (ft)  |                                                                                    |      |      | 117                                                                               |      | 0                                                                                   | ~382                                                                                | 52                                                                                  |      |      | ~879                                                                                | 60                                                                                  |
| Queue Length 95th (ft)  |                                                                                    |      |      | #211                                                                              |      | 20                                                                                  | #610                                                                                | 56                                                                                  |      |      | m646                                                                                | m47                                                                                 |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) | 190                                                                               |                                                                                   |                                                                                   | 385                                                                               |                                                                                   |                                                                                   | 689                                                                                 |                                                                                     |                                                                                     | 710                                                                                 |                                                                                     |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 150                                                                                 | 215                                                                                 |                                                                                     |                                                                                     |                                                                                     | 200                                                                                 |
| Base Capacity (vph)     |                                                                                   |                                                                                   |                                                                                   | 270                                                                               | 237                                                                               |                                                                                   |                                                                                     | 395                                                                                 | 2668                                                                                | 1862                                                                                |                                                                                     |                                                                                     |
| Starvation Cap Reductn  |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |                                                                                     |
| Spillback Cap Reductn   |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |                                                                                     |
| Storage Cap Reductn     |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |                                                                                     |
| Reduced v/c Ratio       |                                                                                   |                                                                                   |                                                                                   | 0.70                                                                              | 0.08                                                                              |                                                                                   |                                                                                     | 1.30                                                                                | 0.25                                                                                | 1.14                                                                                |                                                                                     |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 56 (56%), Referenced to phase 2:SBT and 6:NBTL, Start of Green

Natural Cycle: 150

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.30

Intersection Signal Delay: 73.6

Intersection LOS: E

Intersection Capacity Utilization 101.8%

ICU Level of Service G

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: North Ramp & Centennial Rd



|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |                                                                                   |  |  |  |  |                                                                                   |  |  |                                                                                     |  |  |                                                                                     |
| Volume (veh/h)                    | 12                                                                                | 2                                                                                 | 369                                                                               | 155                                                                               | 8                                                                                 | 69                                                                                | 129                                                                                 | 551                                                                                 | 130                                                                                 | 35                                                                                  | 1871                                                                                | 31                                                                                  |
| Sign Control                      |                                                                                   | Stop                                                                              |                                                                                   |                                                                                   | Stop                                                                              |                                                                                   |                                                                                     | Free                                                                                |                                                                                     |                                                                                     | Free                                                                                |                                                                                     |
| Grade                             |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Peak Hour Factor                  | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Hourly flow rate (vph)            | 13                                                                                | 2                                                                                 | 401                                                                               | 168                                                                               | 9                                                                                 | 75                                                                                | 140                                                                                 | 599                                                                                 | 141                                                                                 | 38                                                                                  | 2034                                                                                | 34                                                                                  |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Width (ft)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Walking Speed (ft/s)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Right turn flare (veh)            |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Median type                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     | None                                                                                |                                                                                     |                                                                                     | None                                                                                |                                                                                     |
| Median storage (veh)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Upstream signal (ft)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 790                                                                                 |                                                                                     |                                                                                     | 1305                                                                                |                                                                                     |
| pX, platoon unblocked             | 0.49                                                                              | 0.49                                                                              | 0.49                                                                              | 0.49                                                                              | 0.49                                                                              |                                                                                   | 0.49                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC, conflicting volume            | 2786                                                                              | 3147                                                                              | 1034                                                                              | 2044                                                                              | 3093                                                                              | 370                                                                               | 2067                                                                                |                                                                                     |                                                                                     | 740                                                                                 |                                                                                     |                                                                                     |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vCu, unblocked vol                | 2565                                                                              | 3299                                                                              | 0                                                                                 | 1057                                                                              | 3190                                                                              | 370                                                                               | 1104                                                                                |                                                                                     |                                                                                     | 740                                                                                 |                                                                                     |                                                                                     |
| tC, single (s)                    | 7.5                                                                               | 6.5                                                                               | 6.9                                                                               | 7.5                                                                               | 6.5                                                                               | 6.9                                                                               | 4.1                                                                                 |                                                                                     |                                                                                     | 4.1                                                                                 |                                                                                     |                                                                                     |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| tF (s)                            | 3.5                                                                               | 4.0                                                                               | 3.3                                                                               | 3.5                                                                               | 4.0                                                                               | 3.3                                                                               | 2.2                                                                                 |                                                                                     |                                                                                     | 2.2                                                                                 |                                                                                     |                                                                                     |
| p0 queue free %                   | 0                                                                                 | 0                                                                                 | 25                                                                                | 0                                                                                 | 0                                                                                 | 88                                                                                | 55                                                                                  |                                                                                     |                                                                                     | 96                                                                                  |                                                                                     |                                                                                     |
| cM capacity (veh/h)               | 0                                                                                 | 2                                                                                 | 533                                                                               | 0                                                                                 | 3                                                                                 | 627                                                                               | 309                                                                                 |                                                                                     |                                                                                     | 862                                                                                 |                                                                                     |                                                                                     |
| Direction, Lane #                 | EB 1                                                                              | WB 1                                                                              | WB 2                                                                              | NB 1                                                                              | NB 2                                                                              | NB 3                                                                              | SB 1                                                                                | SB 2                                                                                | SB 3                                                                                |                                                                                     |                                                                                     |                                                                                     |
| Volume Total                      | 416                                                                               | 168                                                                               | 84                                                                                | 140                                                                               | 399                                                                               | 341                                                                               | 38                                                                                  | 1356                                                                                | 712                                                                                 |                                                                                     |                                                                                     |                                                                                     |
| Volume Left                       | 13                                                                                | 168                                                                               | 0                                                                                 | 140                                                                               | 0                                                                                 | 0                                                                                 | 38                                                                                  | 0                                                                                   | 0                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Volume Right                      | 401                                                                               | 0                                                                                 | 75                                                                                | 0                                                                                 | 0                                                                                 | 141                                                                               | 0                                                                                   | 0                                                                                   | 34                                                                                  |                                                                                     |                                                                                     |                                                                                     |
| cSH                               | 2                                                                                 | 0                                                                                 | 24                                                                                | 309                                                                               | 1700                                                                              | 1700                                                                              | 862                                                                                 | 1700                                                                                | 1700                                                                                |                                                                                     |                                                                                     |                                                                                     |
| Volume to Capacity                | 264.17                                                                            | Err                                                                               | 3.51                                                                              | 0.45                                                                              | 0.23                                                                              | 0.20                                                                              | 0.04                                                                                | 0.80                                                                                | 0.42                                                                                |                                                                                     |                                                                                     |                                                                                     |
| Queue Length 95th (ft)            | Err                                                                               | Err                                                                               | Err                                                                               | 56                                                                                | 0                                                                                 | 0                                                                                 | 3                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Control Delay (s)                 | Err                                                                               | Err                                                                               | Err                                                                               | 26.0                                                                              | 0.0                                                                               | 0.0                                                                               | 9.4                                                                                 | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |                                                                                     |                                                                                     |
| Lane LOS                          | F                                                                                 | F                                                                                 | F                                                                                 | D                                                                                 |                                                                                   |                                                                                   | A                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach Delay (s)                | Err                                                                               | Err                                                                               |                                                                                   | 4.1                                                                               |                                                                                   |                                                                                   | 0.2                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach LOS                      | F                                                                                 | F                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Average Delay                     |                                                                                   |                                                                                   | Err                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 94.1%                                                                             |                                                                                   | ICU Level of Service                                                              |                                                                                   |                                                                                     |                                                                                     |                                                                                     | F                                                                                   |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |  |  |  |  |  |  |                                                                                     |  |  |  |
| Volume (vph)            | 31                                                                                | 42                                                                                | 271                                                                               | 1158                                                                              | 479                                                                               | 63                                                                                | 176                                                                                | 386                                                                                 | 37                                                                                  | 40                                                                                  | 1738                                                                                | 156                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                 | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                               |                                                                                   | 200                                                                               | 215                                                                                |                                                                                     | 0                                                                                   | 215                                                                                 |                                                                                     | 215                                                                                 |
| Storage Lanes           | 1                                                                                 |                                                                                   | 1                                                                                 | 2                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                  |                                                                                     | 0                                                                                   | 1                                                                                   |                                                                                     | 1                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                 |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                    |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 35                                                                                |                                                                                   |                                                                                   | 35                                                                                |                                                                                   |                                                                                    | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 696                                                                               |                                                                                   |                                                                                   | 680                                                                               |                                                                                   |                                                                                    | 1305                                                                                |                                                                                     |                                                                                     | 494                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 13.6                                                                              |                                                                                   |                                                                                   | 13.2                                                                              |                                                                                   |                                                                                    | 22.2                                                                                |                                                                                     |                                                                                     | 8.4                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                               | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                               | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                 | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 34                                                                                | 46                                                                                | 295                                                                               | 1259                                                                              | 521                                                                               | 68                                                                                | 191                                                                                | 460                                                                                 | 0                                                                                   | 43                                                                                  | 1889                                                                                | 170                                                                                 |
| Turn Type               | pm+pt                                                                             |                                                                                   | Perm                                                                              | pm+pt                                                                             |                                                                                   | Perm                                                                              | pm+pt                                                                              |                                                                                     |                                                                                     | pm+pt                                                                               |                                                                                     | Perm                                                                                |
| Protected Phases        | 7                                                                                 | 4                                                                                 |                                                                                   | 3                                                                                 | 8                                                                                 |                                                                                   | 1                                                                                  | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                  |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     | 2                                                                                   |
| Detector Phase          | 7                                                                                 | 4                                                                                 | 4                                                                                 | 3                                                                                 | 8                                                                                 | 8                                                                                 | 1                                                                                  | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   | 2                                                                                   |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 4.0                                                                               | 10.0                                                                              | 10.0                                                                              | 4.0                                                                               | 10.0                                                                              | 10.0                                                                              | 4.0                                                                                | 6.0                                                                                 |                                                                                     | 4.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 |
| Minimum Split (s)       | 8.0                                                                               | 15.7                                                                              | 15.7                                                                              | 8.0                                                                               | 15.7                                                                              | 15.7                                                                              | 8.0                                                                                | 11.5                                                                                |                                                                                     | 8.0                                                                                 | 11.5                                                                                | 11.5                                                                                |
| Total Split (s)         | 12.0                                                                              | 17.0                                                                              | 17.0                                                                              | 26.0                                                                              | 31.0                                                                              | 31.0                                                                              | 12.0                                                                               | 45.0                                                                                | 0.0                                                                                 | 12.0                                                                                | 45.0                                                                                | 45.0                                                                                |
| Total Split (%)         | 12.0%                                                                             | 17.0%                                                                             | 17.0%                                                                             | 26.0%                                                                             | 31.0%                                                                             | 31.0%                                                                             | 12.0%                                                                              | 45.0%                                                                               | 0.0%                                                                                | 12.0%                                                                               | 45.0%                                                                               | 45.0%                                                                               |
| Yellow Time (s)         | 3.5                                                                               | 3.9                                                                               | 3.9                                                                               | 3.5                                                                               | 3.9                                                                               | 3.9                                                                               | 3.5                                                                                | 3.6                                                                                 |                                                                                     | 3.5                                                                                 | 3.6                                                                                 | 3.6                                                                                 |
| All-Red Time (s)        | 0.5                                                                               | 1.8                                                                               | 1.8                                                                               | 0.5                                                                               | 1.8                                                                               | 1.8                                                                               | 0.5                                                                                | 1.9                                                                                 |                                                                                     | 0.5                                                                                 | 1.9                                                                                 | 1.9                                                                                 |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 5.7                                                                               | 5.7                                                                               | 4.0                                                                               | 5.7                                                                               | 5.7                                                                               | 4.0                                                                                | 5.5                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 5.5                                                                                 | 5.5                                                                                 |
| Lead/Lag                | Lead                                                                              | Lead                                                                              | Lead                                                                              | Lag                                                                               | Lag                                                                               | Lag                                                                               | Lag                                                                                | Lag                                                                                 |                                                                                     | Lead                                                                                | Lead                                                                                | Lead                                                                                |
| Lead-Lag Optimize?      | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                                | Yes                                                                                 |                                                                                     | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 |
| Recall Mode             | None                                                                              | Max                                                                               | Max                                                                               | None                                                                              | Max                                                                               | Max                                                                               | None                                                                               | C-Max                                                                               |                                                                                     | None                                                                                | C-Max                                                                               | C-Max                                                                               |
| Act Effect Green (s)    | 13.0                                                                              | 11.3                                                                              | 11.3                                                                              | 32.0                                                                              | 30.3                                                                              | 30.3                                                                              | 46.1                                                                               | 44.6                                                                                |                                                                                     | 41.0                                                                                | 39.5                                                                                | 39.5                                                                                |
| Actuated g/C Ratio      | 0.13                                                                              | 0.11                                                                              | 0.11                                                                              | 0.32                                                                              | 0.30                                                                              | 0.30                                                                              | 0.46                                                                               | 0.45                                                                                |                                                                                     | 0.41                                                                                | 0.40                                                                                | 0.40                                                                                |
| v/c Ratio               | 0.18                                                                              | 0.12                                                                              | 1.05                                                                              | 1.24                                                                              | 0.49                                                                              | 0.13                                                                              | 0.84                                                                               | 0.29                                                                                |                                                                                     | 0.12                                                                                | 1.35                                                                                | 0.25                                                                                |
| Control Delay           | 41.1                                                                              | 40.7                                                                              | 95.2                                                                              | 148.3                                                                             | 31.7                                                                              | 8.1                                                                               | 64.2                                                                               | 14.7                                                                                |                                                                                     | 18.8                                                                                | 191.0                                                                               | 10.0                                                                                |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 |                                                                                     | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             | 41.1                                                                              | 40.7                                                                              | 95.2                                                                              | 148.3                                                                             | 31.7                                                                              | 8.1                                                                               | 64.2                                                                               | 14.7                                                                                |                                                                                     | 18.8                                                                                | 191.0                                                                               | 10.0                                                                                |
| LOS                     | D                                                                                 | D                                                                                 | F                                                                                 | F                                                                                 | C                                                                                 | A                                                                                 | E                                                                                  | B                                                                                   |                                                                                     | B                                                                                   | F                                                                                   | A                                                                                   |
| Approach Delay          |                                                                                   | 83.6                                                                              |                                                                                   |                                                                                   | 110.2                                                                             |                                                                                   |                                                                                    | 29.2                                                                                |                                                                                     |                                                                                     | 172.8                                                                               |                                                                                     |
| Approach LOS            |                                                                                   | F                                                                                 |                                                                                   |                                                                                   | F                                                                                 |                                                                                   |                                                                                    | C                                                                                   |                                                                                     |                                                                                     | F                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 20                                                                                | 14                                                                                | ~136                                                                              | ~553                                                                              | 151                                                                               | 0                                                                                 | 83                                                                                 | 100                                                                                 |                                                                                     | 16                                                                                  | ~835                                                                                | 29                                                                                  |
| Queue Length 95th (ft)  | 49                                                                                | 31                                                                                | #305                                                                              | #691                                                                              | 207                                                                               | 33                                                                                | #207                                                                               | 118                                                                                 |                                                                                     | 38                                                                                  | #973                                                                                | 73                                                                                  |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 616                                                                               |                                                                                   |                                                                                   | 600                                                                               |                                                                                   |                                                                                     | 1225                                                                                |                                                                                     |                                                                                     | 414                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                               |                                                                                   | 200                                                                               | 215                                                                                 |                                                                                     |                                                                                     | 215                                                                                 |                                                                                     | 215                                                                                 |
| Base Capacity (vph)     | 197                                                                               | 400                                                                               | 281                                                                               | 1016                                                                              | 1071                                                                              | 526                                                                               | 227                                                                                 | 1564                                                                                |                                                                                     | 370                                                                                 | 1398                                                                                | 685                                                                                 |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       | 0.17                                                                              | 0.12                                                                              | 1.05                                                                              | 1.24                                                                              | 0.49                                                                              | 0.13                                                                              | 0.84                                                                                | 0.29                                                                                |                                                                                     | 0.12                                                                                | 1.35                                                                                | 0.25                                                                                |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 32 (32%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 150

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.35

Intersection Signal Delay: 124.1

Intersection LOS: F

Intersection Capacity Utilization 110.5%

ICU Level of Service H

Analysis Period (min) 15

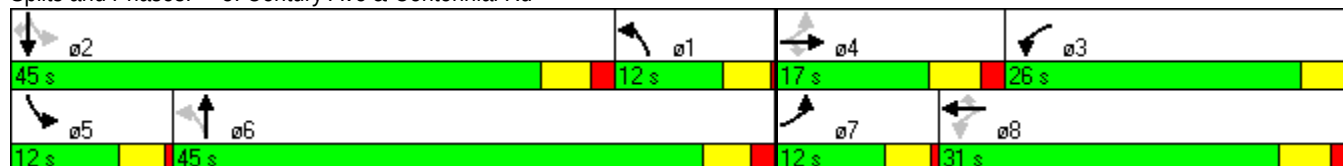
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 5: Century Ave & Centennial Rd



**Appendix Q: 2035 - Existing Control PM (3A2)**

Exit 161 Operational Study  
Bismarck, ND

1: Divide Ave & Bismarck Expy

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |                                                                                   |  |  |  |  |  |  |  |  |  |
| Volume (vph)            | 295                                                                               | 58                                                                                | 26                                                                                | 112                                                                               | 92                                                                                | 410                                                                               | 24                                                                                 | 854                                                                                 | 60                                                                                  | 270                                                                                 | 1150                                                                                | 174                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                 | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 150                                                                               |                                                                                   | 0                                                                                 | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                  |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 100                                                                               |                                                                                   | 25                                                                                | 100                                                                               |                                                                                   | 100                                                                               | 100                                                                                |                                                                                     | 150                                                                                 | 100                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                    |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 25                                                                                |                                                                                   |                                                                                   | 25                                                                                |                                                                                   |                                                                                    | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 371                                                                               |                                                                                   |                                                                                   | 341                                                                               |                                                                                   |                                                                                    | 614                                                                                 |                                                                                     |                                                                                     | 458                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 10.1                                                                              |                                                                                   |                                                                                   | 9.3                                                                               |                                                                                   |                                                                                    | 10.5                                                                                |                                                                                     |                                                                                     | 7.8                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                               | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                               | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 4%                                                                                | 1%                                                                                | 1%                                                                                | 11%                                                                               | 10%                                                                               | 22%                                                                               | 10%                                                                                | 7%                                                                                  | 17%                                                                                 | 11%                                                                                 | 4%                                                                                  | 4%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 321                                                                               | 91                                                                                | 0                                                                                 | 122                                                                               | 100                                                                               | 446                                                                               | 26                                                                                 | 928                                                                                 | 65                                                                                  | 293                                                                                 | 1439                                                                                | 0                                                                                   |
| Turn Type               | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                              |                                                                                   | pm+ov                                                                             | Perm                                                                               |                                                                                     | Perm                                                                                | pm+pt                                                                               |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 | 5                                                                                 |                                                                                    | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                  |                                                                                     | 6                                                                                   | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 | 4                                                                                 |                                                                                   | 8                                                                                 | 8                                                                                 | 5                                                                                 | 6                                                                                  | 6                                                                                   | 6                                                                                   | 5                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               | 6.0                                                                               |                                                                                   | 6.0                                                                               | 6.0                                                                               | 5.0                                                                               | 6.0                                                                                | 6.0                                                                                 | 6.0                                                                                 | 5.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 30.0                                                                              | 30.0                                                                              |                                                                                   | 30.0                                                                              | 30.0                                                                              | 9.8                                                                               | 22.9                                                                               | 22.9                                                                                | 22.9                                                                                | 9.8                                                                                 | 28.7                                                                                |                                                                                     |
| Total Split (s)         | 37.0                                                                              | 37.0                                                                              | 0.0                                                                               | 37.0                                                                              | 37.0                                                                              | 22.0                                                                              | 41.0                                                                               | 41.0                                                                                | 41.0                                                                                | 22.0                                                                                | 63.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 37.0%                                                                             | 37.0%                                                                             | 0.0%                                                                              | 37.0%                                                                             | 37.0%                                                                             | 22.0%                                                                             | 41.0%                                                                              | 41.0%                                                                               | 41.0%                                                                               | 22.0%                                                                               | 63.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 3.0                                                                               | 3.9                                                                                | 3.9                                                                                 | 3.9                                                                                 | 3.0                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 1.0                                                                               | 1.8                                                                                | 1.8                                                                                 | 1.8                                                                                 | 1.0                                                                                 | 1.8                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 5.7                                                                                | 5.7                                                                                 | 5.7                                                                                 | 4.0                                                                                 | 5.7                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lead                                                                              | Lag                                                                                | Lag                                                                                 | Lag                                                                                 | Lag                                                                                 | Lead                                                                                |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                               | Yes                                                                                | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 |                                                                                     |
| Recall Mode             | None                                                                              | None                                                                              |                                                                                   | None                                                                              | None                                                                              | None                                                                              | C-Min                                                                              | C-Min                                                                               | C-Min                                                                               | None                                                                                | C-Min                                                                               |                                                                                     |
| Act Effct Green (s)     | 28.3                                                                              | 28.3                                                                              |                                                                                   | 28.3                                                                              | 28.3                                                                              | 49.7                                                                              | 40.6                                                                               | 40.6                                                                                | 40.6                                                                                | 61.7                                                                                | 60.0                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.28                                                                              | 0.28                                                                              |                                                                                   | 0.28                                                                              | 0.28                                                                              | 0.50                                                                              | 0.41                                                                               | 0.41                                                                                | 0.41                                                                                | 0.62                                                                                | 0.60                                                                                |                                                                                     |
| v/c Ratio               | 0.90                                                                              | 0.17                                                                              |                                                                                   | 0.36                                                                              | 0.20                                                                              | 0.66                                                                              | 0.22                                                                               | 0.68                                                                                | 0.11                                                                                | 0.77                                                                                | 0.70                                                                                |                                                                                     |
| Control Delay           | 62.3                                                                              | 20.1                                                                              |                                                                                   | 31.1                                                                              | 27.3                                                                              | 21.9                                                                              | 29.2                                                                               | 28.9                                                                                | 6.2                                                                                 | 37.5                                                                                | 7.7                                                                                 |                                                                                     |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.1                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.5                                                                                 |                                                                                     |
| Total Delay             | 62.3                                                                              | 20.1                                                                              |                                                                                   | 31.1                                                                              | 27.3                                                                              | 21.9                                                                              | 29.2                                                                               | 28.9                                                                                | 6.2                                                                                 | 37.5                                                                                | 8.1                                                                                 |                                                                                     |
| LOS                     | E                                                                                 | C                                                                                 |                                                                                   | C                                                                                 | C                                                                                 | C                                                                                 | C                                                                                  | C                                                                                   | A                                                                                   | D                                                                                   | A                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 53.0                                                                              |                                                                                   |                                                                                   | 24.4                                                                              |                                                                                   |                                                                                    | 27.5                                                                                |                                                                                     |                                                                                     | 13.1                                                                                |                                                                                     |
| Approach LOS            |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | C                                                                                 |                                                                                   |                                                                                    | C                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 188                                                                               | 31                                                                                |                                                                                   | 59                                                                                | 46                                                                                | 168                                                                               | 12                                                                                 | 274                                                                                 | 0                                                                                   | 110                                                                                 | 155                                                                                 |                                                                                     |
| Queue Length 95th (ft)  | #336                                                                              | 69                                                                                |                                                                                   | 110                                                                               | 87                                                                                | 270                                                                               | 36                                                                                 | 353                                                                                 | 28                                                                                  | #206                                                                                | 202                                                                                 |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 291                                                                               |                                                                                   |                                                                                   | 261                                                                               |                                                                                   |                                                                                     | 534                                                                                 |                                                                                     |                                                                                     | 378                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 150                                                                               |                                                                                   |                                                                                   | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                 |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 392                                                                               | 572                                                                               |                                                                                   | 370                                                                               | 535                                                                               | 707                                                                               | 117                                                                                 | 1371                                                                                | 599                                                                                 | 418                                                                                 | 2052                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 226                                                                                 |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 26                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.82                                                                              | 0.16                                                                              |                                                                                   | 0.33                                                                              | 0.19                                                                              | 0.63                                                                              | 0.22                                                                                | 0.69                                                                                | 0.11                                                                                | 0.70                                                                                | 0.79                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 13 (13%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.90

Intersection Signal Delay: 23.2

Intersection LOS: C

Intersection Capacity Utilization 79.8%

ICU Level of Service D

Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 1: Divide Ave & Bismarck Expy



|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |                                                                                   |  |                                                                                   |                                                                                   |                                                                                   |                                                                                    |  |  |  |  |  |
| Volume (vph)            | 394                                                                               | 0                                                                                 | 529                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 1584                                                                                | 155                                                                                 | 35                                                                                  | 724                                                                                 | 0                                                                                   |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                 | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 200                                                                               |                                                                                   | 200                                                                               | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  |                                                                                     | 0                                                                                   | 222                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 2                                                                                 |                                                                                   | 2                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 300                                                                               | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                 |                                                                                     | 25                                                                                  | 150                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                    |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                    | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 575                                                                               |                                                                                   |                                                                                   | 383                                                                               |                                                                                   |                                                                                    | 458                                                                                 |                                                                                     |                                                                                     | 769                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 13.1                                                                              |                                                                                   |                                                                                   | 8.7                                                                               |                                                                                   |                                                                                    | 7.8                                                                                 |                                                                                     |                                                                                     | 13.1                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                               | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                               | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 3%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                 | 8%                                                                                  | 27%                                                                                 | 10%                                                                                 | 9%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 428                                                                               | 0                                                                                 | 575                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 1722                                                                                | 168                                                                                 | 38                                                                                  | 787                                                                                 | 0                                                                                   |
| Turn Type               | custom                                                                            |                                                                                   | custom                                                                            |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     | Perm                                                                                | Perm                                                                                |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     | 6                                                                                   | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                   | 6                                                                                   | 2                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               |                                                                                   | 6.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 21.1                                                                              |                                                                                   | 21.1                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 23.4                                                                                | 23.4                                                                                | 21.4                                                                                | 21.4                                                                                |                                                                                     |
| Total Split (s)         | 26.0                                                                              | 0.0                                                                               | 26.0                                                                              | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 74.0                                                                                | 74.0                                                                                | 74.0                                                                                | 74.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 26.0%                                                                             | 0.0%                                                                              | 26.0%                                                                             | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                               | 74.0%                                                                               | 74.0%                                                                               | 74.0%                                                                               | 74.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.6                                                                               |                                                                                   | 3.6                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 1.5                                                                               |                                                                                   | 1.5                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 1.5                                                                                 | 1.5                                                                                 | 1.5                                                                                 | 1.5                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 5.1                                                                               | 4.0                                                                               | 5.1                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                                | 5.4                                                                                 | 5.4                                                                                 | 5.4                                                                                 | 5.4                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Recall Mode             | None                                                                              |                                                                                   | None                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               |                                                                                     |
| Act Effect Green (s)    | 18.2                                                                              |                                                                                   | 18.2                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 71.3                                                                                | 71.3                                                                                | 71.3                                                                                | 71.3                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.18                                                                              |                                                                                   | 0.18                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.71                                                                                | 0.71                                                                                | 0.71                                                                                | 0.71                                                                                |                                                                                     |
| v/c Ratio               | 0.69                                                                              |                                                                                   | 0.67                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.72                                                                                | 0.18                                                                                | 0.34                                                                                | 0.33                                                                                |                                                                                     |
| Control Delay           | 44.1                                                                              |                                                                                   | 13.5                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 8.1                                                                                 | 1.4                                                                                 | 16.6                                                                                | 4.3                                                                                 |                                                                                     |
| Queue Delay             | 0.0                                                                               |                                                                                   | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.7                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |
| Total Delay             | 44.1                                                                              |                                                                                   | 13.5                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 8.8                                                                                 | 1.4                                                                                 | 16.6                                                                                | 4.3                                                                                 |                                                                                     |
| LOS                     | D                                                                                 |                                                                                   | B                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | A                                                                                   | A                                                                                   | B                                                                                   | A                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 8.2                                                                                 |                                                                                     |                                                                                     | 4.9                                                                                 |                                                                                     |
| Approach LOS            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | A                                                                                   |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 130                                                                               |                                                                                   | 44                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 156                                                                                 | 3                                                                                   | 3                                                                                   | 31                                                                                  |                                                                                     |
| Queue Length 95th (ft)  | 178                                                                               |                                                                                   | 103                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 216                                                                                 | m11                                                                                 | m14                                                                                 | 37                                                                                  |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 495                                                                               |                                                                                   |                                                                                   | 303                                                                               |                                                                                   |                                                                                    | 378                                                                                 |                                                                                     |                                                                                     | 689                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 200                                                                               |                                                                                   | 200                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | 222                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 711                                                                               |                                                                                   | 923                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 2382                                                                                | 955                                                                                 | 113                                                                                 | 2360                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 315                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.60                                                                              |                                                                                   | 0.62                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.83                                                                                | 0.18                                                                                | 0.34                                                                                | 0.33                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 6 (6%), Referenced to phase 2:SBTL and 6:NBT, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.72

Intersection Signal Delay: 12.4

Intersection LOS: B

Intersection Capacity Utilization 73.3%

ICU Level of Service D

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: South Ramp & Centennial Rd

|                                                                                        |                                                                                         |
|----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
|  ø2  |  ø4 |
| 74 s                                                                                   | 26 s                                                                                    |
|  ø6 |                                                                                         |
| 74 s                                                                                   |                                                                                         |

|                         |  |      |      |                                                                                   |      |                                                                                     |                                                                                     |                                                                                     |      |      |                                                                                     |                                                                                     |
|-------------------------|------------------------------------------------------------------------------------|------|------|-----------------------------------------------------------------------------------|------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------|------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                                | EBT  | EBR  | WBL                                                                               | WBT  | WBR                                                                                 | NBL                                                                                 | NBT                                                                                 | NBR  | SBL  | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |                                                                                    |      |      |  |      |  |  |  |      |      |  |  |
| Volume (vph)            | 0                                                                                  | 0    | 0    | 92                                                                                | 0    | 19                                                                                  | 528                                                                                 | 1502                                                                                | 0    | 0    | 767                                                                                 | 213                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                               | 1900 | 1900 | 1900                                                                              | 1900 | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900 | 1900 | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                 | 12   | 12   | 16                                                                                | 12   | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12   | 12   | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                    | 0%   |      |                                                                                   | 0%   |                                                                                     |                                                                                     | 0%                                                                                  |      |      | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 0                                                                                  |      | 0    | 0                                                                                 |      | 150                                                                                 | 215                                                                                 |                                                                                     | 0    | 0    |                                                                                     | 200                                                                                 |
| Storage Lanes           | 0                                                                                  |      | 0    | 1                                                                                 |      | 1                                                                                   | 1                                                                                   |                                                                                     | 0    | 0    |                                                                                     | 1                                                                                   |
| Taper Length (ft)       | 25                                                                                 |      | 25   | 25                                                                                |      | 100                                                                                 | 150                                                                                 |                                                                                     | 25   | 25   |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                    |      | Yes  |                                                                                   |      | Yes                                                                                 |                                                                                     |                                                                                     | Yes  |      |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                    | 30   |      |                                                                                   | 30   |                                                                                     |                                                                                     | 40                                                                                  |      |      | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                    | 270  |      |                                                                                   | 465  |                                                                                     |                                                                                     | 769                                                                                 |      |      | 788                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                    | 6.1  |      |                                                                                   | 10.6 |                                                                                     |                                                                                     | 13.1                                                                                |      |      | 13.4                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     |                                                                                     |      |      |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     |                                                                                     |      |      |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                               | 0.92 | 0.92 | 0.92                                                                              | 0.92 | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92 | 0.92 | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                               | 100% | 100% | 100%                                                                              | 100% | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100% | 100% | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                 | 2%   | 2%   | 12%                                                                               | 2%   | 8%                                                                                  | 6%                                                                                  | 3%                                                                                  | 2%   | 2%   | 3%                                                                                  | 1%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                  | 0    | 0    | 0                                                                                 | 0    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0    | 0    | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     |                                                                                     |      |      |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                    | 0%   |      |                                                                                   | 0%   |                                                                                     |                                                                                     | 0%                                                                                  |      |      | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     |                                                                                     |      |      |                                                                                     | 10%                                                                                 |
| Lane Group Flow (vph)   | 0                                                                                  | 0    | 0    | 100                                                                               | 0    | 21                                                                                  | 574                                                                                 | 1633                                                                                | 0    | 0    | 857                                                                                 | 209                                                                                 |
| Turn Type               |                                                                                    |      |      | custom                                                                            |      | custom                                                                              | pm+pt                                                                               |                                                                                     |      |      |                                                                                     | Perm                                                                                |
| Protected Phases        |                                                                                    |      |      |                                                                                   |      |                                                                                     | 1                                                                                   | 6                                                                                   |      |      | 2                                                                                   |                                                                                     |
| Permitted Phases        |                                                                                    |      |      | 8                                                                                 |      | 8                                                                                   | 6                                                                                   |                                                                                     |      |      |                                                                                     | 2                                                                                   |
| Detector Phase          |                                                                                    |      |      | 8                                                                                 |      | 8                                                                                   | 1                                                                                   | 6                                                                                   |      |      | 2                                                                                   | 2                                                                                   |
| Switch Phase            |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     |                                                                                     |      |      |                                                                                     |                                                                                     |
| Minimum Initial (s)     |                                                                                    |      |      | 5.0                                                                               |      | 5.0                                                                                 | 5.0                                                                                 | 10.0                                                                                |      |      | 10.0                                                                                | 10.0                                                                                |
| Minimum Split (s)       |                                                                                    |      |      | 20.0                                                                              |      | 20.0                                                                                | 9.0                                                                                 | 20.0                                                                                |      |      | 22.4                                                                                | 22.4                                                                                |
| Total Split (s)         | 0.0                                                                                | 0.0  | 0.0  | 20.0                                                                              | 0.0  | 20.0                                                                                | 40.0                                                                                | 80.0                                                                                | 0.0  | 0.0  | 40.0                                                                                | 40.0                                                                                |
| Total Split (%)         | 0.0%                                                                               | 0.0% | 0.0% | 20.0%                                                                             | 0.0% | 20.0%                                                                               | 40.0%                                                                               | 80.0%                                                                               | 0.0% | 0.0% | 40.0%                                                                               | 40.0%                                                                               |
| Yellow Time (s)         |                                                                                    |      |      | 3.2                                                                               |      | 3.2                                                                                 | 3.0                                                                                 | 3.9                                                                                 |      |      | 3.9                                                                                 | 3.9                                                                                 |
| All-Red Time (s)        |                                                                                    |      |      | 2.0                                                                               |      | 2.0                                                                                 | 1.0                                                                                 | 1.5                                                                                 |      |      | 1.5                                                                                 | 1.5                                                                                 |
| Lost Time Adjust (s)    | 0.0                                                                                | 0.0  | 0.0  | 0.0                                                                               | 0.0  | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0  | 0.0  | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                                | 4.0  | 4.0  | 5.2                                                                               | 4.0  | 5.2                                                                                 | 4.0                                                                                 | 5.4                                                                                 | 4.0  | 4.0  | 5.4                                                                                 | 5.4                                                                                 |
| Lead/Lag                |                                                                                    |      |      |                                                                                   |      |                                                                                     | Lag                                                                                 |                                                                                     |      |      | Lead                                                                                | Lead                                                                                |
| Lead-Lag Optimize?      |                                                                                    |      |      |                                                                                   |      |                                                                                     | Yes                                                                                 |                                                                                     |      |      | Yes                                                                                 | Yes                                                                                 |
| Recall Mode             |                                                                                    |      |      | None                                                                              |      | None                                                                                | None                                                                                | C-Min                                                                               |      |      | C-Min                                                                               | C-Min                                                                               |
| Act Effect Green (s)    |                                                                                    |      |      | 9.8                                                                               |      | 9.8                                                                                 | 83.1                                                                                | 82.8                                                                                |      |      | 44.3                                                                                | 44.3                                                                                |
| Actuated g/C Ratio      |                                                                                    |      |      | 0.10                                                                              |      | 0.10                                                                                | 0.83                                                                                | 0.83                                                                                |      |      | 0.44                                                                                | 0.44                                                                                |
| v/c Ratio               |                                                                                    |      |      | 0.56                                                                              |      | 0.13                                                                                | 0.75                                                                                | 0.56                                                                                |      |      | 0.58                                                                                | 0.27                                                                                |
| Control Delay           |                                                                                    |      |      | 54.1                                                                              |      | 17.3                                                                                | 17.8                                                                                | 3.0                                                                                 |      |      | 20.6                                                                                | 3.4                                                                                 |
| Queue Delay             |                                                                                    |      |      | 0.0                                                                               |      | 0.0                                                                                 | 0.0                                                                                 | 0.1                                                                                 |      |      | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             |                                                                                    |      |      | 54.1                                                                              |      | 17.3                                                                                | 17.8                                                                                | 3.1                                                                                 |      |      | 20.6                                                                                | 3.4                                                                                 |
| LOS                     |                                                                                    |      |      | D                                                                                 |      | B                                                                                   | B                                                                                   | A                                                                                   |      |      | C                                                                                   | A                                                                                   |
| Approach Delay          |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     | 6.9                                                                                 |      |      | 17.2                                                                                |                                                                                     |
| Approach LOS            |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     | A                                                                                   |      |      | B                                                                                   |                                                                                     |
| Queue Length 50th (ft)  |                                                                                    |      |      | 62                                                                                |      | 0                                                                                   | 120                                                                                 | 98                                                                                  |      |      | 257                                                                                 | 6                                                                                   |
| Queue Length 95th (ft)  |                                                                                    |      |      | 110                                                                               |      | 22                                                                                  | 264                                                                                 | 145                                                                                 |      |      | 350                                                                                 | 36                                                                                  |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 190                                                                               |                                                                                   |                                                                                   | 385                                                                               |                                                                                   |                                                                                     | 689                                                                                 |                                                                                     |                                                                                     | 708                                                                                 |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 150                                                                               | 215                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     | 200                                                                                 |
| Base Capacity (vph)     |                                                                                   |                                                                                   |                                                                                   | 270                                                                               |                                                                                   | 239                                                                               | 804                                                                                 | 2903                                                                                |                                                                                     |                                                                                     | 1485                                                                                | 761                                                                                 |
| Starvation Cap Reductn  |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                   | 223                                                                                 |                                                                                     |                                                                                     | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                   | 0                                                                                   |                                                                                     |                                                                                     | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                   | 0                                                                                   |                                                                                     |                                                                                     | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       |                                                                                   |                                                                                   |                                                                                   | 0.37                                                                              |                                                                                   | 0.09                                                                              | 0.71                                                                                | 0.61                                                                                |                                                                                     |                                                                                     | 0.58                                                                                | 0.27                                                                                |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 93 (93%), Referenced to phase 2:SBT and 6:NBTL, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.75

Intersection Signal Delay: 11.6

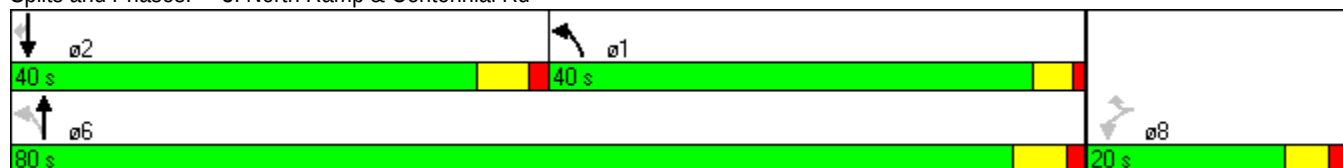
Intersection LOS: B

Intersection Capacity Utilization 73.3%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 3: North Ramp & Centennial Rd



|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |                                                                                   |  |  |  |  |                                                                                   |  |  |                                                                                     |  |  |                                                                                     |
| Volume (veh/h)                    | 24                                                                                | 4                                                                                 | 149                                                                               | 206                                                                               | 2                                                                                 | 131                                                                               | 235                                                                                 | 1866                                                                                | 338                                                                                 | 80                                                                                  | 853                                                                                 | 24                                                                                  |
| Sign Control                      |                                                                                   | Stop                                                                              |                                                                                   |                                                                                   | Stop                                                                              |                                                                                   |                                                                                     | Free                                                                                |                                                                                     |                                                                                     | Free                                                                                |                                                                                     |
| Grade                             |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Peak Hour Factor                  | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Hourly flow rate (vph)            | 26                                                                                | 4                                                                                 | 162                                                                               | 224                                                                               | 2                                                                                 | 142                                                                               | 255                                                                                 | 2028                                                                                | 367                                                                                 | 87                                                                                  | 927                                                                                 | 26                                                                                  |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Width (ft)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Walking Speed (ft/s)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Right turn flare (veh)            |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Median type                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     | None                                                                                |                                                                                     |                                                                                     | None                                                                                |                                                                                     |
| Median storage veh                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Upstream signal (ft)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 788                                                                                 |                                                                                     |                                                                                     | 1304                                                                                |                                                                                     |
| pX, platoon unblocked             | 0.84                                                                              | 0.84                                                                              | 0.97                                                                              | 0.84                                                                              | 0.84                                                                              | 0.83                                                                              | 0.97                                                                                |                                                                                     |                                                                                     | 0.83                                                                                |                                                                                     |                                                                                     |
| vC, conflicting volume            | 2783                                                                              | 4021                                                                              | 477                                                                               | 3362                                                                              | 3850                                                                              | 1198                                                                              | 953                                                                                 |                                                                                     |                                                                                     | 2396                                                                                |                                                                                     |                                                                                     |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vCu, unblocked vol                | 2580                                                                              | 4052                                                                              | 398                                                                               | 3269                                                                              | 3849                                                                              | 819                                                                               | 890                                                                                 |                                                                                     |                                                                                     | 2269                                                                                |                                                                                     |                                                                                     |
| tC, single (s)                    | 7.5                                                                               | 6.5                                                                               | 6.9                                                                               | 7.5                                                                               | 6.5                                                                               | 6.9                                                                               | 4.1                                                                                 |                                                                                     |                                                                                     | 4.1                                                                                 |                                                                                     |                                                                                     |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| tF (s)                            | 3.5                                                                               | 4.0                                                                               | 3.3                                                                               | 3.5                                                                               | 4.0                                                                               | 3.3                                                                               | 2.2                                                                                 |                                                                                     |                                                                                     | 2.2                                                                                 |                                                                                     |                                                                                     |
| p0 queue free %                   | 0                                                                                 | 0                                                                                 | 72                                                                                | 0                                                                                 | 0                                                                                 | 46                                                                                | 65                                                                                  |                                                                                     |                                                                                     | 53                                                                                  |                                                                                     |                                                                                     |
| cM capacity (veh/h)               | 0                                                                                 | 1                                                                                 | 583                                                                               | 0                                                                                 | 1                                                                                 | 263                                                                               | 735                                                                                 |                                                                                     |                                                                                     | 183                                                                                 |                                                                                     |                                                                                     |
| Direction, Lane #                 | EB 1                                                                              | WB 1                                                                              | WB 2                                                                              | NB 1                                                                              | NB 2                                                                              | NB 3                                                                              | SB 1                                                                                | SB 2                                                                                | SB 3                                                                                |                                                                                     |                                                                                     |                                                                                     |
| Volume Total                      | 192                                                                               | 224                                                                               | 145                                                                               | 255                                                                               | 1352                                                                              | 1043                                                                              | 87                                                                                  | 618                                                                                 | 335                                                                                 |                                                                                     |                                                                                     |                                                                                     |
| Volume Left                       | 26                                                                                | 224                                                                               | 0                                                                                 | 255                                                                               | 0                                                                                 | 0                                                                                 | 87                                                                                  | 0                                                                                   | 0                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Volume Right                      | 162                                                                               | 0                                                                                 | 142                                                                               | 0                                                                                 | 0                                                                                 | 367                                                                               | 0                                                                                   | 0                                                                                   | 26                                                                                  |                                                                                     |                                                                                     |                                                                                     |
| cSH                               | 0                                                                                 | 0                                                                                 | 55                                                                                | 735                                                                               | 1700                                                                              | 1700                                                                              | 183                                                                                 | 1700                                                                                | 1700                                                                                |                                                                                     |                                                                                     |                                                                                     |
| Volume to Capacity                | 3049.89                                                                           | Err                                                                               | 2.64                                                                              | 0.35                                                                              | 0.80                                                                              | 0.61                                                                              | 0.47                                                                                | 0.36                                                                                | 0.20                                                                                |                                                                                     |                                                                                     |                                                                                     |
| Queue Length 95th (ft)            | Err                                                                               | Err                                                                               | 372                                                                               | 39                                                                                | 0                                                                                 | 0                                                                                 | 57                                                                                  | 0                                                                                   | 0                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Control Delay (s)                 | Err                                                                               | Err                                                                               | 904.1                                                                             | 12.5                                                                              | 0.0                                                                               | 0.0                                                                               | 41.2                                                                                | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |                                                                                     |                                                                                     |
| Lane LOS                          | F                                                                                 | F                                                                                 | F                                                                                 | B                                                                                 |                                                                                   |                                                                                   | E                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach Delay (s)                | Err                                                                               | Err                                                                               |                                                                                   | 1.2                                                                               |                                                                                   |                                                                                   | 3.4                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach LOS                      | F                                                                                 | F                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Average Delay                     |                                                                                   |                                                                                   | Err                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 94.9%                                                                             |                                                                                   | ICU Level of Service                                                              |                                                                                   |                                                                                     |                                                                                     | F                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |  |  |  |  |  |  |  |  |  |  |
| Volume (vph)            | 98                                                                                | 300                                                                               | 253                                                                               | 238                                                                               | 191                                                                               | 47                                                                                | 243                                                                                | 771                                                                                 | 331                                                                                 | 70                                                                                  | 483                                                                                 | 60                                                                                  |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                 | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                                |                                                                                     | 0                                                                                   | 215                                                                                 |                                                                                     | 215                                                                                 |
| Storage Lanes           | 1                                                                                 |                                                                                   | 1                                                                                 | 2                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                  |                                                                                     | 0                                                                                   | 1                                                                                   |                                                                                     | 1                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                 |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                    |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 35                                                                                |                                                                                   |                                                                                   | 35                                                                                |                                                                                   |                                                                                    | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 656                                                                               |                                                                                   |                                                                                   | 630                                                                               |                                                                                   |                                                                                    | 1304                                                                                |                                                                                     |                                                                                     | 510                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 12.8                                                                              |                                                                                   |                                                                                   | 12.3                                                                              |                                                                                   |                                                                                    | 22.2                                                                                |                                                                                     |                                                                                     | 8.7                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                               | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                               | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                 | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     | 10%                                                                                 |
| Lane Group Flow (vph)   | 107                                                                               | 326                                                                               | 275                                                                               | 259                                                                               | 208                                                                               | 51                                                                                | 264                                                                                | 1198                                                                                | 0                                                                                   | 76                                                                                  | 532                                                                                 | 58                                                                                  |
| Turn Type               | pm+pt                                                                             |                                                                                   | Perm                                                                              | pm+pt                                                                             |                                                                                   | Perm                                                                              | pm+pt                                                                              |                                                                                     |                                                                                     | pm+pt                                                                               |                                                                                     | Perm                                                                                |
| Protected Phases        | 7                                                                                 | 4                                                                                 |                                                                                   | 3                                                                                 | 8                                                                                 |                                                                                   | 1                                                                                  | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                  |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     | 2                                                                                   |
| Detector Phase          | 7                                                                                 | 4                                                                                 | 4                                                                                 | 3                                                                                 | 8                                                                                 | 8                                                                                 | 1                                                                                  | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   | 2                                                                                   |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 4.0                                                                               | 10.0                                                                              | 10.0                                                                              | 4.0                                                                               | 10.0                                                                              | 10.0                                                                              | 4.0                                                                                | 6.0                                                                                 |                                                                                     | 4.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 |
| Minimum Split (s)       | 8.0                                                                               | 15.7                                                                              | 15.7                                                                              | 8.0                                                                               | 15.7                                                                              | 15.7                                                                              | 8.0                                                                                | 11.5                                                                                |                                                                                     | 8.0                                                                                 | 11.5                                                                                | 11.5                                                                                |
| Total Split (s)         | 12.0                                                                              | 24.0                                                                              | 24.0                                                                              | 12.0                                                                              | 24.0                                                                              | 24.0                                                                              | 19.0                                                                               | 53.0                                                                                | 0.0                                                                                 | 11.0                                                                                | 45.0                                                                                | 45.0                                                                                |
| Total Split (%)         | 12.0%                                                                             | 24.0%                                                                             | 24.0%                                                                             | 12.0%                                                                             | 24.0%                                                                             | 24.0%                                                                             | 19.0%                                                                              | 53.0%                                                                               | 0.0%                                                                                | 11.0%                                                                               | 45.0%                                                                               | 45.0%                                                                               |
| Yellow Time (s)         | 3.5                                                                               | 3.9                                                                               | 3.9                                                                               | 3.5                                                                               | 3.9                                                                               | 3.9                                                                               | 3.5                                                                                | 3.6                                                                                 |                                                                                     | 3.5                                                                                 | 3.6                                                                                 | 3.6                                                                                 |
| All-Red Time (s)        | 0.5                                                                               | 1.8                                                                               | 1.8                                                                               | 0.5                                                                               | 1.8                                                                               | 1.8                                                                               | 0.5                                                                                | 1.9                                                                                 |                                                                                     | 0.5                                                                                 | 1.9                                                                                 | 1.9                                                                                 |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 5.7                                                                               | 5.7                                                                               | 4.0                                                                               | 5.7                                                                               | 5.7                                                                               | 4.0                                                                                | 5.5                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 5.5                                                                                 | 5.5                                                                                 |
| Lead/Lag                | Lag                                                                               | Lead                                                                              | Lead                                                                              | Lag                                                                               | Lead                                                                              | Lead                                                                              | Lag                                                                                | Lead                                                                                |                                                                                     | Lag                                                                                 | Lead                                                                                | Lead                                                                                |
| Lead-Lag Optimize?      | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                                | Yes                                                                                 |                                                                                     | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 |
| Recall Mode             | None                                                                              | Max                                                                               | Max                                                                               | None                                                                              | Max                                                                               | Max                                                                               | None                                                                               | C-Max                                                                               |                                                                                     | None                                                                                | C-Max                                                                               | C-Max                                                                               |
| Act Effect Green (s)    | 25.9                                                                              | 18.3                                                                              | 18.3                                                                              | 25.9                                                                              | 18.3                                                                              | 18.3                                                                              | 62.1                                                                               | 52.3                                                                                |                                                                                     | 51.7                                                                                | 44.0                                                                                | 44.0                                                                                |
| Actuated g/C Ratio      | 0.26                                                                              | 0.18                                                                              | 0.18                                                                              | 0.26                                                                              | 0.18                                                                              | 0.18                                                                              | 0.62                                                                               | 0.52                                                                                |                                                                                     | 0.52                                                                                | 0.44                                                                                | 0.44                                                                                |
| v/c Ratio               | 0.32                                                                              | 0.50                                                                              | 0.54                                                                              | 0.48                                                                              | 0.32                                                                              | 0.15                                                                              | 0.45                                                                               | 0.66                                                                                |                                                                                     | 0.36                                                                                | 0.36                                                                                | 0.09                                                                                |
| Control Delay           | 30.3                                                                              | 39.9                                                                              | 8.7                                                                               | 32.7                                                                              | 37.1                                                                              | 11.2                                                                              | 16.3                                                                               | 16.0                                                                                |                                                                                     | 19.8                                                                                | 20.0                                                                                | 5.4                                                                                 |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 |                                                                                     | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             | 30.3                                                                              | 39.9                                                                              | 8.7                                                                               | 32.7                                                                              | 37.1                                                                              | 11.2                                                                              | 16.3                                                                               | 16.0                                                                                |                                                                                     | 19.8                                                                                | 20.0                                                                                | 5.4                                                                                 |
| LOS                     | C                                                                                 | D                                                                                 | A                                                                                 | C                                                                                 | D                                                                                 | B                                                                                 | B                                                                                  | B                                                                                   |                                                                                     | B                                                                                   | C                                                                                   | A                                                                                   |
| Approach Delay          |                                                                                   | 26.3                                                                              |                                                                                   |                                                                                   | 32.4                                                                              |                                                                                   |                                                                                    | 16.1                                                                                |                                                                                     |                                                                                     | 18.7                                                                                |                                                                                     |
| Approach LOS            |                                                                                   | C                                                                                 |                                                                                   |                                                                                   | C                                                                                 |                                                                                   |                                                                                    | B                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 51                                                                                | 99                                                                                | 0                                                                                 | 64                                                                                | 61                                                                                | 0                                                                                 | 70                                                                                 | 248                                                                                 |                                                                                     | 18                                                                                  | 123                                                                                 | 0                                                                                   |
| Queue Length 95th (ft)  | 93                                                                                | 144                                                                               | 69                                                                                | 95                                                                                | 95                                                                                | 32                                                                                | 113                                                                                | 330                                                                                 |                                                                                     | 36                                                                                  | 173                                                                                 | 26                                                                                  |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 576                                                                               |                                                                                   |                                                                                   | 550                                                                               |                                                                                   |                                                                                     | 1224                                                                                |                                                                                     |                                                                                     | 430                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                                 |                                                                                     |                                                                                     | 215                                                                                 |                                                                                     | 215                                                                                 |
| Base Capacity (vph)     | 373                                                                               | 648                                                                               | 514                                                                               | 612                                                                               | 648                                                                               | 331                                                                               | 629                                                                                 | 1812                                                                                |                                                                                     | 228                                                                                 | 1490                                                                                | 667                                                                                 |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       | 0.29                                                                              | 0.50                                                                              | 0.54                                                                              | 0.42                                                                              | 0.32                                                                              | 0.15                                                                              | 0.42                                                                                | 0.66                                                                                |                                                                                     | 0.33                                                                                | 0.36                                                                                | 0.09                                                                                |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 58 (58%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.66

Intersection Signal Delay: 21.3

Intersection LOS: C

Intersection Capacity Utilization 66.9%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 5: Century Ave & Centennial Rd

|                                                                                        |                                                                                        |                                                                                         |                                                                                          |
|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
|  ø2   |  ø1   |  ø4   |  ø3   |
| 45 s                                                                                   | 19 s                                                                                   | 24 s                                                                                    | 12 s                                                                                     |
|  ø6 |  ø5 |  ø8 |  ø7 |
| 53 s                                                                                   | 11 s                                                                                   | 24 s                                                                                    | 12 s                                                                                     |

**Appendix R: 2035 – Signal at Trenton AM (3B1)**

Exit 161 Operational Study  
Bismarck, ND

1: Divide Ave & Bismarck Expy

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |                                                                                   |  |  |  |  |  |  |  |  |  |
| Volume (vph)            | 116                                                                               | 125                                                                               | 18                                                                                | 141                                                                               | 96                                                                                | 328                                                                               | 25                                                                                  | 430                                                                                 | 72                                                                                  | 428                                                                                 | 1468                                                                                | 328                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 150                                                                               |                                                                                   | 0                                                                                 | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                 |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                   |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 100                                                                               |                                                                                   | 25                                                                                | 100                                                                               |                                                                                   | 100                                                                               | 100                                                                                 |                                                                                     | 150                                                                                 | 100                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 25                                                                                |                                                                                   |                                                                                   | 25                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 371                                                                               |                                                                                   |                                                                                   | 341                                                                               |                                                                                   |                                                                                     | 614                                                                                 |                                                                                     |                                                                                     | 458                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 10.1                                                                              |                                                                                   |                                                                                   | 9.3                                                                               |                                                                                   |                                                                                     | 10.5                                                                                |                                                                                     |                                                                                     | 7.8                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 4%                                                                                | 1%                                                                                | 1%                                                                                | 11%                                                                               | 10%                                                                               | 22%                                                                               | 10%                                                                                 | 7%                                                                                  | 17%                                                                                 | 11%                                                                                 | 4%                                                                                  | 4%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 126                                                                               | 156                                                                               | 0                                                                                 | 153                                                                               | 104                                                                               | 357                                                                               | 27                                                                                  | 467                                                                                 | 78                                                                                  | 465                                                                                 | 1953                                                                                | 0                                                                                   |
| Turn Type               | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                              |                                                                                   | pm+ov                                                                             | Perm                                                                                |                                                                                     | Perm                                                                                | pm+pt                                                                               |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 | 5                                                                                 |                                                                                     | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                   |                                                                                     | 6                                                                                   | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 | 4                                                                                 |                                                                                   | 8                                                                                 | 8                                                                                 | 5                                                                                 | 6                                                                                   | 6                                                                                   | 6                                                                                   | 5                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               | 6.0                                                                               |                                                                                   | 6.0                                                                               | 6.0                                                                               | 5.0                                                                               | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 5.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 30.0                                                                              | 30.0                                                                              |                                                                                   | 30.0                                                                              | 30.0                                                                              | 9.8                                                                               | 22.9                                                                                | 22.9                                                                                | 22.9                                                                                | 9.8                                                                                 | 28.7                                                                                |                                                                                     |
| Total Split (s)         | 30.0                                                                              | 30.0                                                                              | 0.0                                                                               | 30.0                                                                              | 30.0                                                                              | 24.1                                                                              | 45.9                                                                                | 45.9                                                                                | 45.9                                                                                | 24.1                                                                                | 70.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 30.0%                                                                             | 30.0%                                                                             | 0.0%                                                                              | 30.0%                                                                             | 30.0%                                                                             | 24.1%                                                                             | 45.9%                                                                               | 45.9%                                                                               | 45.9%                                                                               | 24.1%                                                                               | 70.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 3.0                                                                               | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 | 3.0                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 1.0                                                                               | 1.8                                                                                 | 1.8                                                                                 | 1.8                                                                                 | 1.0                                                                                 | 1.8                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 5.7                                                                                 | 5.7                                                                                 | 5.7                                                                                 | 4.0                                                                                 | 5.7                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lead                                                                              | Lag                                                                                 | Lag                                                                                 | Lag                                                                                 | Lead                                                                                |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                               | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 |                                                                                     |                                                                                     |
| Recall Mode             | None                                                                              | None                                                                              |                                                                                   | None                                                                              | None                                                                              | None                                                                              | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               | None                                                                                | C-Min                                                                               |                                                                                     |
| Act Effect Green (s)    | 18.6                                                                              | 18.6                                                                              |                                                                                   | 18.6                                                                              | 18.6                                                                              | 41.3                                                                              | 49.0                                                                                | 49.0                                                                                | 49.0                                                                                | 71.4                                                                                | 69.7                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.19                                                                              | 0.19                                                                              |                                                                                   | 0.19                                                                              | 0.19                                                                              | 0.41                                                                              | 0.49                                                                                | 0.49                                                                                | 0.49                                                                                | 0.71                                                                                | 0.70                                                                                |                                                                                     |
| v/c Ratio               | 0.54                                                                              | 0.45                                                                              |                                                                                   | 0.81                                                                              | 0.32                                                                              | 0.52                                                                              | 0.39                                                                                | 0.28                                                                                | 0.11                                                                                | 0.69                                                                                | 0.82                                                                                |                                                                                     |
| Control Delay           | 44.2                                                                              | 37.3                                                                              |                                                                                   | 67.7                                                                              | 36.4                                                                              | 8.5                                                                               | 42.6                                                                                | 17.5                                                                                | 4.9                                                                                 | 10.8                                                                                | 11.1                                                                                |                                                                                     |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.5                                                                                 |                                                                                     |
| Total Delay             | 44.2                                                                              | 37.3                                                                              |                                                                                   | 67.7                                                                              | 36.4                                                                              | 8.5                                                                               | 42.6                                                                                | 17.5                                                                                | 4.9                                                                                 | 10.8                                                                                | 11.6                                                                                |                                                                                     |
| LOS                     | D                                                                                 | D                                                                                 |                                                                                   | E                                                                                 | D                                                                                 | A                                                                                 | D                                                                                   | B                                                                                   | A                                                                                   | B                                                                                   | B                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 40.4                                                                              |                                                                                   |                                                                                   | 28.0                                                                              |                                                                                   |                                                                                     | 17.0                                                                                |                                                                                     |                                                                                     | 11.5                                                                                |                                                                                     |
| Approach LOS            |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | C                                                                                 |                                                                                   |                                                                                     | B                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 72                                                                                | 84                                                                                |                                                                                   | 93                                                                                | 57                                                                                | 45                                                                                | 11                                                                                  | 94                                                                                  | 0                                                                                   | 100                                                                                 | 262                                                                                 |                                                                                     |
| Queue Length 95th (ft)  | 125                                                                               | 137                                                                               |                                                                                   | #162                                                                              | 101                                                                               | 104                                                                               | #55                                                                                 | 146                                                                                 | 28                                                                                  | 168                                                                                 | 356                                                                                 |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 291                                                                               |                                                                                   |                                                                                   | 261                                                                               |                                                                                   |                                                                                    | 534                                                                                 |                                                                                     |                                                                                     | 378                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 150                                                                               |                                                                                   |                                                                                   | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 303                                                                               | 448                                                                               |                                                                                   | 245                                                                               | 414                                                                               | 727                                                                               | 70                                                                                 | 1652                                                                                | 715                                                                                 | 702                                                                                 | 2369                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 2                                                                                   | 130                                                                                 |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.42                                                                              | 0.35                                                                              |                                                                                   | 0.62                                                                              | 0.25                                                                              | 0.49                                                                              | 0.39                                                                               | 0.28                                                                                | 0.11                                                                                | 0.66                                                                                | 0.87                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 62 (62%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.82

Intersection Signal Delay: 17.0

Intersection LOS: B

Intersection Capacity Utilization 91.0%

ICU Level of Service F

Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 1: Divide Ave & Bismarck Expy

|                                                                                        |                                                                                          |
|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
|  ø2 |  ø4 |
| 70 s                                                                                   | 30 s                                                                                     |
|  ø5 |  ø8 |
| 24.1 s                                                                                 | 30 s                                                                                     |
|  ø6 |                                                                                          |
| 45.9 s                                                                                 |                                                                                          |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |                                                                                   |  |                                                                                   |                                                                                   |                                                                                   |                                                                                    |  |  |  |  |  |
| Volume (vph)            | 178                                                                               | 0                                                                                 | 720                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 788                                                                                 | 115                                                                                 | 30                                                                                  | 1178                                                                                | 0                                                                                   |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                 | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 200                                                                               |                                                                                   | 200                                                                               | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  |                                                                                     | 0                                                                                   | 222                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 2                                                                                 |                                                                                   | 2                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 300                                                                               | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                 |                                                                                     | 25                                                                                  | 150                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                    |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                    | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 575                                                                               |                                                                                   |                                                                                   | 383                                                                               |                                                                                   |                                                                                    | 458                                                                                 |                                                                                     |                                                                                     | 769                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 13.1                                                                              |                                                                                   |                                                                                   | 8.7                                                                               |                                                                                   |                                                                                    | 7.8                                                                                 |                                                                                     |                                                                                     | 13.1                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                               | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                               | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 3%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                 | 8%                                                                                  | 27%                                                                                 | 10%                                                                                 | 9%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 193                                                                               | 0                                                                                 | 783                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 857                                                                                 | 125                                                                                 | 33                                                                                  | 1280                                                                                | 0                                                                                   |
| Turn Type               | custom                                                                            |                                                                                   | custom                                                                            |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     | Perm                                                                                | Perm                                                                                |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     | 6                                                                                   | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                   | 6                                                                                   | 2                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               |                                                                                   | 6.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 21.1                                                                              |                                                                                   | 21.1                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 23.4                                                                                | 23.4                                                                                | 21.4                                                                                | 21.4                                                                                |                                                                                     |
| Total Split (s)         | 42.0                                                                              | 0.0                                                                               | 42.0                                                                              | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 58.0                                                                                | 58.0                                                                                | 58.0                                                                                | 58.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 42.0%                                                                             | 0.0%                                                                              | 42.0%                                                                             | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                               | 58.0%                                                                               | 58.0%                                                                               | 58.0%                                                                               | 58.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.6                                                                               |                                                                                   | 3.6                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 1.5                                                                               |                                                                                   | 1.5                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 1.5                                                                                 | 1.5                                                                                 | 1.5                                                                                 | 1.5                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 5.1                                                                               | 4.0                                                                               | 5.1                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                                | 5.4                                                                                 | 5.4                                                                                 | 5.4                                                                                 | 5.4                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Recall Mode             | None                                                                              |                                                                                   | None                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               |                                                                                     |
| Act Effct Green (s)     | 31.5                                                                              |                                                                                   | 31.5                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 58.0                                                                                | 58.0                                                                                | 58.0                                                                                | 58.0                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.32                                                                              |                                                                                   | 0.32                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.58                                                                                | 0.58                                                                                | 0.58                                                                                | 0.58                                                                                |                                                                                     |
| v/c Ratio               | 0.18                                                                              |                                                                                   | 0.84                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.44                                                                                | 0.16                                                                                | 0.12                                                                                | 0.67                                                                                |                                                                                     |
| Control Delay           | 24.2                                                                              |                                                                                   | 37.6                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 12.1                                                                                | 3.4                                                                                 | 2.6                                                                                 | 5.0                                                                                 |                                                                                     |
| Queue Delay             | 0.0                                                                               |                                                                                   | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.1                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.2                                                                                 |                                                                                     |
| Total Delay             | 24.2                                                                              |                                                                                   | 37.6                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 12.2                                                                                | 3.4                                                                                 | 2.6                                                                                 | 5.2                                                                                 |                                                                                     |
| LOS                     | C                                                                                 |                                                                                   | D                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | B                                                                                   | A                                                                                   | A                                                                                   | A                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 11.1                                                                                |                                                                                     |                                                                                     | 5.2                                                                                 |                                                                                     |
| Approach LOS            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | B                                                                                   |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 45                                                                                |                                                                                   | 238                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 127                                                                                 | 5                                                                                   | 2                                                                                   | 76                                                                                  |                                                                                     |
| Queue Length 95th (ft)  | 66                                                                                |                                                                                   | 298                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 173                                                                                 | 21                                                                                  | m3                                                                                  | m148                                                                                |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 495                                                                               |                                                                                   |                                                                                   | 303                                                                               |                                                                                   |                                                                                    | 378                                                                                 |                                                                                     |                                                                                     | 689                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 200                                                                               |                                                                                   | 200                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | 222                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 1255                                                                              |                                                                                   | 1074                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 1938                                                                                | 790                                                                                 | 281                                                                                 | 1920                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 310                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 |                                                                                   | 3                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 143                                                                                 |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.15                                                                              |                                                                                   | 0.73                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.53                                                                                | 0.16                                                                                | 0.12                                                                                | 0.72                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 48 (48%), Referenced to phase 2:SBTL and 6:NBT, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.84

Intersection Signal Delay: 15.8

Intersection LOS: B

Intersection Capacity Utilization 101.8%

ICU Level of Service G

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: South Ramp & Centennial Rd

|                                                                                        |                                                                                       |
|----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|  ø2  |  ø4 |
| 58 s                                                                                   | 42 s                                                                                  |
|  ø6 |                                                                                       |
| 58 s                                                                                   |                                                                                       |

|                         |  |  |  |  |  |  |   |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |                                                                                   |                                                                                   |                                                                                   |  |                                                                                   |  |  |  |                                                                                     |                                                                                     |  |  |
| Volume (vph)            | 0                                                                                 | 0                                                                                 | 0                                                                                 | 175                                                                               | 0                                                                                 | 17                                                                                | 471                                                                                 | 605                                                                                 | 0                                                                                   | 0                                                                                   | 1949                                                                                | 435                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 16                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 150                                                                               | 215                                                                                 |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     | 200                                                                                 |
| Storage Lanes           | 0                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     | 1                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 100                                                                               | 150                                                                                 |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 270                                                                               |                                                                                   |                                                                                   | 465                                                                               |                                                                                   |                                                                                     | 769                                                                                 |                                                                                     |                                                                                     | 776                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 6.1                                                                               |                                                                                   |                                                                                   | 10.6                                                                              |                                                                                   |                                                                                     | 13.1                                                                                |                                                                                     |                                                                                     | 13.2                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                | 2%                                                                                | 2%                                                                                | 12%                                                                               | 2%                                                                                | 8%                                                                                | 6%                                                                                  | 3%                                                                                  | 2%                                                                                  | 2%                                                                                  | 3%                                                                                  | 1%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 190                                                                               | 0                                                                                 | 18                                                                                | 512                                                                                 | 658                                                                                 | 0                                                                                   | 0                                                                                   | 2118                                                                                | 473                                                                                 |
| Turn Type               |                                                                                   |                                                                                   |                                                                                   | custom                                                                            |                                                                                   | custom                                                                            | pm+pt                                                                               |                                                                                     |                                                                                     |                                                                                     |                                                                                     | Perm                                                                                |
| Protected Phases        |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        |                                                                                   |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     | 2                                                                                   |
| Detector Phase          |                                                                                   |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 8                                                                                 | 1                                                                                   | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   | 2                                                                                   |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     |                                                                                   |                                                                                   |                                                                                   | 5.0                                                                               |                                                                                   | 5.0                                                                               | 5.0                                                                                 | 10.0                                                                                |                                                                                     |                                                                                     | 10.0                                                                                | 10.0                                                                                |
| Minimum Split (s)       |                                                                                   |                                                                                   |                                                                                   | 20.0                                                                              |                                                                                   | 20.0                                                                              | 9.0                                                                                 | 20.0                                                                                |                                                                                     |                                                                                     | 22.4                                                                                | 22.4                                                                                |
| Total Split (s)         | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 20.0                                                                              | 0.0                                                                               | 20.0                                                                              | 23.0                                                                                | 80.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 57.0                                                                                | 57.0                                                                                |
| Total Split (%)         | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                              | 20.0%                                                                             | 0.0%                                                                              | 20.0%                                                                             | 23.0%                                                                               | 80.0%                                                                               | 0.0%                                                                                | 0.0%                                                                                | 57.0%                                                                               | 57.0%                                                                               |
| Yellow Time (s)         |                                                                                   |                                                                                   |                                                                                   | 3.2                                                                               |                                                                                   | 3.2                                                                               | 3.0                                                                                 | 3.9                                                                                 |                                                                                     |                                                                                     | 3.9                                                                                 | 3.9                                                                                 |
| All-Red Time (s)        |                                                                                   |                                                                                   |                                                                                   | 2.0                                                                               |                                                                                   | 2.0                                                                               | 1.0                                                                                 | 1.5                                                                                 |                                                                                     |                                                                                     | 1.5                                                                                 | 1.5                                                                                 |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 5.2                                                                               | 4.0                                                                               | 5.2                                                                               | 4.0                                                                                 | 5.4                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 5.4                                                                                 | 5.4                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lag                                                                                 |                                                                                     |                                                                                     |                                                                                     | Lead                                                                                | Lead                                                                                |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                                 |                                                                                     |                                                                                     |                                                                                     | Yes                                                                                 | Yes                                                                                 |
| Recall Mode             |                                                                                   |                                                                                   |                                                                                   | None                                                                              |                                                                                   | None                                                                              | None                                                                                | C-Min                                                                               |                                                                                     |                                                                                     | C-Min                                                                               | C-Min                                                                               |
| Act Effect Green (s)    |                                                                                   |                                                                                   |                                                                                   | 13.3                                                                              |                                                                                   | 13.3                                                                              | 77.5                                                                                | 76.1                                                                                |                                                                                     |                                                                                     | 53.1                                                                                | 53.1                                                                                |
| Actuated g/C Ratio      |                                                                                   |                                                                                   |                                                                                   | 0.13                                                                              |                                                                                   | 0.13                                                                              | 0.78                                                                                | 0.76                                                                                |                                                                                     |                                                                                     | 0.53                                                                                | 0.53                                                                                |
| v/c Ratio               |                                                                                   |                                                                                   |                                                                                   | 0.79                                                                              |                                                                                   | 0.08                                                                              | 1.30                                                                                | 0.25                                                                                |                                                                                     |                                                                                     | 1.14                                                                                | 0.48                                                                                |
| Control Delay           |                                                                                   |                                                                                   |                                                                                   | 64.2                                                                              |                                                                                   | 16.9                                                                              | 177.2                                                                               | 2.8                                                                                 |                                                                                     |                                                                                     | 85.7                                                                                | 2.8                                                                                 |
| Queue Delay             |                                                                                   |                                                                                   |                                                                                   | 0.0                                                                               |                                                                                   | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |                                                                                     | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             |                                                                                   |                                                                                   |                                                                                   | 64.2                                                                              |                                                                                   | 16.9                                                                              | 177.2                                                                               | 2.8                                                                                 |                                                                                     |                                                                                     | 85.7                                                                                | 2.8                                                                                 |
| LOS                     |                                                                                   |                                                                                   |                                                                                   | E                                                                                 |                                                                                   | B                                                                                 | F                                                                                   | A                                                                                   |                                                                                     |                                                                                     | F                                                                                   | A                                                                                   |
| Approach Delay          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 79.1                                                                                |                                                                                     |                                                                                     | 70.5                                                                                |                                                                                     |
| Approach LOS            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     | E                                                                                   |                                                                                     |                                                                                     | E                                                                                   |                                                                                     |
| Queue Length 50th (ft)  |                                                                                   |                                                                                   |                                                                                   | 117                                                                               |                                                                                   | 0                                                                                 | ~382                                                                                | 52                                                                                  |                                                                                     |                                                                                     | ~884                                                                                | 20                                                                                  |
| Queue Length 95th (ft)  |                                                                                   |                                                                                   |                                                                                   | #211                                                                              |                                                                                   | 20                                                                                | #610                                                                                | 56                                                                                  |                                                                                     |                                                                                     | m#951                                                                               | m19                                                                                 |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) | 190                                                                               |                                                                                   |                                                                                   | 385                                                                               |                                                                                   |                                                                                   | 689                                                                                 |                                                                                     |                                                                                     | 696                                                                                 |                                                                                     |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 150                                                                                 | 215                                                                                 |                                                                                     |                                                                                     |                                                                                     | 200                                                                                 |
| Base Capacity (vph)     |                                                                                   |                                                                                   |                                                                                   | 270                                                                               |                                                                                   | 237                                                                               | 395                                                                                 | 2668                                                                                |                                                                                     |                                                                                     | 1862                                                                                | 983                                                                                 |
| Starvation Cap Reductn  |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                   | 0                                                                                   |                                                                                     |                                                                                     | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                   | 0                                                                                   |                                                                                     |                                                                                     | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                   | 0                                                                                   |                                                                                     |                                                                                     | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       |                                                                                   |                                                                                   |                                                                                   | 0.70                                                                              |                                                                                   | 0.08                                                                              | 1.30                                                                                | 0.25                                                                                |                                                                                     |                                                                                     | 1.14                                                                                | 0.48                                                                                |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 26 (26%), Referenced to phase 2:SBT and 6:NBTL, Start of Green

Natural Cycle: 150

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.30

Intersection Signal Delay: 72.5

Intersection LOS: E

Intersection Capacity Utilization 101.8%

ICU Level of Service G

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: North Ramp & Centennial Rd



|                         |  |  |  |  |  |  |   |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |                                                                                   |  |  |  |  |                                                                                   |  |  |                                                                                     |  |  |  |
| Volume (vph)            | 12                                                                                | 2                                                                                 | 369                                                                               | 155                                                                               | 8                                                                                 | 69                                                                                | 129                                                                                 | 551                                                                                 | 130                                                                                 | 35                                                                                  | 1871                                                                                | 31                                                                                  |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 0                                                                                 |                                                                                   | 200                                                                               | 200                                                                               |                                                                                   | 200                                                                               | 530                                                                                 |                                                                                     | 0                                                                                   | 215                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 0                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                   |                                                                                     | 0                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                  |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 709                                                                               |                                                                                   |                                                                                   | 951                                                                               |                                                                                   |                                                                                     | 776                                                                                 |                                                                                     |                                                                                     | 1318                                                                                |                                                                                     |
| Travel Time (s)         |                                                                                   | 16.1                                                                              |                                                                                   |                                                                                   | 21.6                                                                              |                                                                                   |                                                                                     | 13.2                                                                                |                                                                                     |                                                                                     | 22.5                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 0                                                                                 | 15                                                                                | 401                                                                               | 168                                                                               | 84                                                                                | 0                                                                                 | 140                                                                                 | 740                                                                                 | 0                                                                                   | 38                                                                                  | 2068                                                                                | 0                                                                                   |
| Turn Type               | Perm                                                                              |                                                                                   | Perm                                                                              | Perm                                                                              |                                                                                   |                                                                                   | pm+pt                                                                               |                                                                                     |                                                                                     | Perm                                                                                |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 | 8                                                                                 |                                                                                   |                                                                                   | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 | 4                                                                                 | 4                                                                                 | 8                                                                                 | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     | 2                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               |                                                                                   | 5.0                                                                                 | 4.0                                                                                 |                                                                                     | 4.0                                                                                 | 4.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              |                                                                                   | 9.0                                                                                 | 20.0                                                                                |                                                                                     | 20.0                                                                                | 20.0                                                                                |                                                                                     |
| Total Split (s)         | 25.0                                                                              | 25.0                                                                              | 25.0                                                                              | 25.0                                                                              | 25.0                                                                              | 0.0                                                                               | 12.0                                                                                | 75.0                                                                                | 0.0                                                                                 | 63.0                                                                                | 63.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 25.0%                                                                             | 25.0%                                                                             | 25.0%                                                                             | 25.0%                                                                             | 25.0%                                                                             | 0.0%                                                                              | 12.0%                                                                               | 75.0%                                                                               | 0.0%                                                                                | 63.0%                                                                               | 63.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               |                                                                                   | 3.5                                                                                 | 3.5                                                                                 |                                                                                     | 3.5                                                                                 | 3.5                                                                                 |                                                                                     |
| All-Red Time (s)        | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               |                                                                                   | 0.5                                                                                 | 0.5                                                                                 |                                                                                     | 0.5                                                                                 | 0.5                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lead                                                                                |                                                                                     |                                                                                     | Lag                                                                                 | Lag                                                                                 |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 | Yes                                                                                 |                                                                                     |
| Recall Mode             | None                                                                              | None                                                                              | None                                                                              | None                                                                              | None                                                                              |                                                                                   | None                                                                                | C-Min                                                                               |                                                                                     | C-Min                                                                               | C-Min                                                                               |                                                                                     |
| Act Effect Green (s)    |                                                                                   | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              |                                                                                   | 72.0                                                                                | 72.0                                                                                |                                                                                     | 60.4                                                                                | 60.4                                                                                |                                                                                     |
| Actuated g/C Ratio      |                                                                                   | 0.20                                                                              | 0.20                                                                              | 0.20                                                                              | 0.20                                                                              |                                                                                   | 0.72                                                                                | 0.72                                                                                |                                                                                     | 0.60                                                                                | 0.60                                                                                |                                                                                     |
| v/c Ratio               |                                                                                   | 0.05                                                                              | 0.94                                                                              | 0.60                                                                              | 0.22                                                                              |                                                                                   | 0.67                                                                                | 0.30                                                                                |                                                                                     | 0.09                                                                                | 0.97                                                                                |                                                                                     |
| Control Delay           |                                                                                   | 32.1                                                                              | 57.0                                                                              | 46.0                                                                              | 11.1                                                                              |                                                                                   | 32.5                                                                                | 6.3                                                                                 |                                                                                     | 4.7                                                                                 | 17.9                                                                                |                                                                                     |
| Queue Delay             |                                                                                   | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                                 | 0.0                                                                                 |                                                                                     | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |
| Total Delay             |                                                                                   | 32.1                                                                              | 57.0                                                                              | 46.0                                                                              | 11.1                                                                              |                                                                                   | 32.5                                                                                | 6.3                                                                                 |                                                                                     | 4.7                                                                                 | 17.9                                                                                |                                                                                     |
| LOS                     |                                                                                   | C                                                                                 | E                                                                                 | D                                                                                 | B                                                                                 |                                                                                   | C                                                                                   | A                                                                                   |                                                                                     | A                                                                                   | B                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 56.1                                                                              |                                                                                   |                                                                                   | 34.4                                                                              |                                                                                   |                                                                                     | 10.5                                                                                |                                                                                     |                                                                                     | 17.6                                                                                |                                                                                     |
| Approach LOS            |                                                                                   | E                                                                                 |                                                                                   |                                                                                   | C                                                                                 |                                                                                   |                                                                                     | B                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| Queue Length 50th (ft)  |                                                                                   | 8                                                                                 | 170                                                                               | 97                                                                                | 5                                                                                 |                                                                                   | 41                                                                                  | 105                                                                                 |                                                                                     | 7                                                                                   | 753                                                                                 |                                                                                     |
| Queue Length 95th (ft)  |                                                                                   | 25                                                                                | #351                                                                              | 167                                                                               | 44                                                                                |                                                                                   | #117                                                                                | 121                                                                                 |                                                                                     | m5                                                                                  | m320                                                                                |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 629                                                                               |                                                                                   |                                                                                   | 871                                                                               |                                                                                   |                                                                                    | 696                                                                                 |                                                                                     |                                                                                     | 1238                                                                                |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   | 200                                                                               | 200                                                                               |                                                                                   |                                                                                   | 530                                                                                |                                                                                     |                                                                                     | 215                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     |                                                                                   | 324                                                                               | 442                                                                               | 293                                                                               | 398                                                                               |                                                                                   | 215                                                                                | 2495                                                                                |                                                                                     | 418                                                                                 | 2135                                                                                |                                                                                     |
| Starvation Cap Reductn  |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       |                                                                                   | 0.05                                                                              | 0.91                                                                              | 0.57                                                                              | 0.21                                                                              |                                                                                   | 0.65                                                                               | 0.30                                                                                |                                                                                     | 0.09                                                                                | 0.97                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 2 (2%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.97

Intersection Signal Delay: 21.4

Intersection LOS: C

Intersection Capacity Utilization 94.1%

ICU Level of Service F

Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Trenton Dr & Centennial Rd

|                                                                                        |                                                                                        |                                                                                          |
|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
|  ø1 |  ø2 |  ø4 |
| 12 s                                                                                   | 63 s                                                                                   | 25 s                                                                                     |
|  ø6 |                                                                                        |  ø8 |
| 75 s                                                                                   |                                                                                        | 25 s                                                                                     |

|                         |  |  |  |  |  |  |   |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |  |  |  |  |  |  |  |  |  |  |
| Volume (vph)            | 31                                                                                | 42                                                                                | 271                                                                               | 1158                                                                              | 479                                                                               | 63                                                                                | 176                                                                                 | 386                                                                                 | 37                                                                                  | 40                                                                                  | 1738                                                                                | 156                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                                 |                                                                                     | 0                                                                                   | 215                                                                                 |                                                                                     | 215                                                                                 |
| Storage Lanes           | 1                                                                                 |                                                                                   | 1                                                                                 | 2                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                   |                                                                                     | 0                                                                                   | 1                                                                                   |                                                                                     | 1                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                  |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 35                                                                                |                                                                                   |                                                                                   | 35                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 805                                                                               |                                                                                   |                                                                                   | 659                                                                               |                                                                                   |                                                                                     | 1318                                                                                |                                                                                     |                                                                                     | 490                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 15.7                                                                              |                                                                                   |                                                                                   | 12.8                                                                              |                                                                                   |                                                                                     | 22.5                                                                                |                                                                                     |                                                                                     | 8.4                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 34                                                                                | 46                                                                                | 295                                                                               | 1259                                                                              | 521                                                                               | 68                                                                                | 191                                                                                 | 460                                                                                 | 0                                                                                   | 43                                                                                  | 1889                                                                                | 170                                                                                 |
| Turn Type               | pm+pt                                                                             |                                                                                   | Perm                                                                              | pm+pt                                                                             |                                                                                   | Perm                                                                              | pm+pt                                                                               |                                                                                     |                                                                                     | pm+pt                                                                               |                                                                                     | Perm                                                                                |
| Protected Phases        | 7                                                                                 | 4                                                                                 |                                                                                   | 3                                                                                 | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     | 2                                                                                   |
| Detector Phase          | 7                                                                                 | 4                                                                                 | 4                                                                                 | 3                                                                                 | 8                                                                                 | 8                                                                                 | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   | 2                                                                                   |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 4.0                                                                               | 10.0                                                                              | 10.0                                                                              | 4.0                                                                               | 10.0                                                                              | 10.0                                                                              | 4.0                                                                                 | 6.0                                                                                 |                                                                                     | 4.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 |
| Minimum Split (s)       | 8.0                                                                               | 15.7                                                                              | 15.7                                                                              | 8.0                                                                               | 15.7                                                                              | 15.7                                                                              | 8.0                                                                                 | 11.5                                                                                |                                                                                     | 8.0                                                                                 | 11.5                                                                                | 11.5                                                                                |
| Total Split (s)         | 12.0                                                                              | 17.0                                                                              | 17.0                                                                              | 26.0                                                                              | 31.0                                                                              | 31.0                                                                              | 12.0                                                                                | 45.0                                                                                | 0.0                                                                                 | 12.0                                                                                | 45.0                                                                                | 45.0                                                                                |
| Total Split (%)         | 12.0%                                                                             | 17.0%                                                                             | 17.0%                                                                             | 26.0%                                                                             | 31.0%                                                                             | 31.0%                                                                             | 12.0%                                                                               | 45.0%                                                                               | 0.0%                                                                                | 12.0%                                                                               | 45.0%                                                                               | 45.0%                                                                               |
| Yellow Time (s)         | 3.5                                                                               | 3.9                                                                               | 3.9                                                                               | 3.5                                                                               | 3.9                                                                               | 3.9                                                                               | 3.5                                                                                 | 3.6                                                                                 |                                                                                     | 3.5                                                                                 | 3.6                                                                                 | 3.6                                                                                 |
| All-Red Time (s)        | 0.5                                                                               | 1.8                                                                               | 1.8                                                                               | 0.5                                                                               | 1.8                                                                               | 1.8                                                                               | 0.5                                                                                 | 1.9                                                                                 |                                                                                     | 0.5                                                                                 | 1.9                                                                                 | 1.9                                                                                 |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 5.7                                                                               | 5.7                                                                               | 4.0                                                                               | 5.7                                                                               | 5.7                                                                               | 4.0                                                                                 | 5.5                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 5.5                                                                                 | 5.5                                                                                 |
| Lead/Lag                | Lead                                                                              | Lead                                                                              | Lead                                                                              | Lag                                                                               | Lag                                                                               | Lag                                                                               | Lag                                                                                 | Lead                                                                                |                                                                                     | Lag                                                                                 | Lead                                                                                | Lead                                                                                |
| Lead-Lag Optimize?      | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                                 | Yes                                                                                 |                                                                                     | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 |
| Recall Mode             | None                                                                              | Max                                                                               | Max                                                                               | None                                                                              | Max                                                                               | Max                                                                               | None                                                                                | C-Max                                                                               |                                                                                     | None                                                                                | C-Max                                                                               | C-Max                                                                               |
| Act Effect Green (s)    | 13.0                                                                              | 11.3                                                                              | 11.3                                                                              | 32.1                                                                              | 30.4                                                                              | 30.4                                                                              | 50.5                                                                                | 44.2                                                                                |                                                                                     | 47.9                                                                                | 39.5                                                                                | 39.5                                                                                |
| Actuated g/C Ratio      | 0.13                                                                              | 0.11                                                                              | 0.11                                                                              | 0.32                                                                              | 0.30                                                                              | 0.30                                                                              | 0.50                                                                                | 0.44                                                                                |                                                                                     | 0.48                                                                                | 0.40                                                                                | 0.40                                                                                |
| v/c Ratio               | 0.18                                                                              | 0.12                                                                              | 1.00                                                                              | 1.23                                                                              | 0.48                                                                              | 0.13                                                                              | 0.88                                                                                | 0.30                                                                                |                                                                                     | 0.09                                                                                | 1.35                                                                                | 0.25                                                                                |
| Control Delay           | 41.1                                                                              | 40.7                                                                              | 79.8                                                                              | 146.2                                                                             | 31.6                                                                              | 8.1                                                                               | 64.6                                                                                | 12.6                                                                                |                                                                                     | 12.7                                                                                | 191.0                                                                               | 10.0                                                                                |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 |                                                                                     | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             | 41.1                                                                              | 40.7                                                                              | 79.8                                                                              | 146.2                                                                             | 31.6                                                                              | 8.1                                                                               | 64.6                                                                                | 12.6                                                                                |                                                                                     | 12.7                                                                                | 191.0                                                                               | 10.0                                                                                |
| LOS                     | D                                                                                 | D                                                                                 | E                                                                                 | F                                                                                 | C                                                                                 | A                                                                                 | E                                                                                   | B                                                                                   |                                                                                     | B                                                                                   | F                                                                                   | A                                                                                   |
| Approach Delay          |                                                                                   | 71.5                                                                              |                                                                                   |                                                                                   | 108.8                                                                             |                                                                                   |                                                                                     | 27.8                                                                                |                                                                                     |                                                                                     | 172.7                                                                               |                                                                                     |
| Approach LOS            |                                                                                   | E                                                                                 |                                                                                   |                                                                                   | F                                                                                 |                                                                                   |                                                                                     | C                                                                                   |                                                                                     |                                                                                     | F                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 20                                                                                | 14                                                                                | ~111                                                                              | ~553                                                                              | 151                                                                               | 0                                                                                 | 75                                                                                  | 66                                                                                  |                                                                                     | 13                                                                                  | ~835                                                                                | 29                                                                                  |
| Queue Length 95th (ft)  | 49                                                                                | 31                                                                                | #286                                                                              | #691                                                                              | 207                                                                               | 33                                                                                | #202                                                                                | 93                                                                                  |                                                                                     | 29                                                                                  | #973                                                                                | 73                                                                                  |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 725                                                                               |                                                                                   |                                                                                   | 579                                                                               |                                                                                   |                                                                                    | 1238                                                                                |                                                                                     |                                                                                     | 410                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                                |                                                                                     |                                                                                     | 215                                                                                 |                                                                                     | 215                                                                                 |
| Base Capacity (vph)     | 197                                                                               | 400                                                                               | 294                                                                               | 1020                                                                              | 1075                                                                              | 528                                                                               | 220                                                                                | 1550                                                                                |                                                                                     | 476                                                                                 | 1398                                                                                | 685                                                                                 |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       | 0.17                                                                              | 0.12                                                                              | 1.00                                                                              | 1.23                                                                              | 0.48                                                                              | 0.13                                                                              | 0.87                                                                               | 0.30                                                                                |                                                                                     | 0.09                                                                                | 1.35                                                                                | 0.25                                                                                |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 91 (91%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 150

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.35

Intersection Signal Delay: 122.4

Intersection LOS: F

Intersection Capacity Utilization 110.5%

ICU Level of Service H

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 5: Century Ave & Centennial Rd

|                                                                                        |                                                                                        |                                                                                        |                                                                                          |
|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
|  ø2 |  ø1 |  ø4 |  ø3 |
| 45 s                                                                                   | 12 s                                                                                   | 17 s                                                                                   | 26 s                                                                                     |
|  ø6 |  ø5 |  ø7 |  ø8 |
| 45 s                                                                                   | 12 s                                                                                   | 12 s                                                                                   | 31 s                                                                                     |



**Appendix S: 2035 – Signal at Trenton PM (3B2)**

Exit 161 Operational Study  
Bismarck, ND

1: Divide Ave & Bismarck Expy

|                         |  |  |  |  |  |  |   |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |                                                                                   |  |  |  |  |  |  |  |  |  |
| Volume (vph)            | 295                                                                               | 58                                                                                | 26                                                                                | 112                                                                               | 92                                                                                | 410                                                                               | 24                                                                                  | 854                                                                                 | 60                                                                                  | 270                                                                                 | 1150                                                                                | 174                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 150                                                                               |                                                                                   | 0                                                                                 | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                 |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                   |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 100                                                                               |                                                                                   | 25                                                                                | 100                                                                               |                                                                                   | 100                                                                               | 100                                                                                 |                                                                                     | 150                                                                                 | 100                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 25                                                                                |                                                                                   |                                                                                   | 25                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 371                                                                               |                                                                                   |                                                                                   | 341                                                                               |                                                                                   |                                                                                     | 614                                                                                 |                                                                                     |                                                                                     | 458                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 10.1                                                                              |                                                                                   |                                                                                   | 9.3                                                                               |                                                                                   |                                                                                     | 10.5                                                                                |                                                                                     |                                                                                     | 7.8                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 4%                                                                                | 1%                                                                                | 1%                                                                                | 11%                                                                               | 10%                                                                               | 22%                                                                               | 10%                                                                                 | 7%                                                                                  | 17%                                                                                 | 11%                                                                                 | 4%                                                                                  | 4%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 321                                                                               | 91                                                                                | 0                                                                                 | 122                                                                               | 100                                                                               | 446                                                                               | 26                                                                                  | 928                                                                                 | 65                                                                                  | 293                                                                                 | 1439                                                                                | 0                                                                                   |
| Turn Type               | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                              |                                                                                   | pm+ov                                                                             | Perm                                                                                |                                                                                     | Perm                                                                                | pm+pt                                                                               |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 | 5                                                                                 |                                                                                     | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                   |                                                                                     | 6                                                                                   | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 | 4                                                                                 |                                                                                   | 8                                                                                 | 8                                                                                 | 5                                                                                 | 6                                                                                   | 6                                                                                   | 6                                                                                   | 5                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               | 6.0                                                                               |                                                                                   | 6.0                                                                               | 6.0                                                                               | 5.0                                                                               | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 5.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 30.0                                                                              | 30.0                                                                              |                                                                                   | 30.0                                                                              | 30.0                                                                              | 9.8                                                                               | 22.9                                                                                | 22.9                                                                                | 22.9                                                                                | 9.8                                                                                 | 28.7                                                                                |                                                                                     |
| Total Split (s)         | 37.0                                                                              | 37.0                                                                              | 0.0                                                                               | 37.0                                                                              | 37.0                                                                              | 23.0                                                                              | 40.0                                                                                | 40.0                                                                                | 40.0                                                                                | 23.0                                                                                | 63.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 37.0%                                                                             | 37.0%                                                                             | 0.0%                                                                              | 37.0%                                                                             | 37.0%                                                                             | 23.0%                                                                             | 40.0%                                                                               | 40.0%                                                                               | 40.0%                                                                               | 23.0%                                                                               | 63.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 3.0                                                                               | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 | 3.0                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 1.0                                                                               | 1.8                                                                                 | 1.8                                                                                 | 1.8                                                                                 | 1.0                                                                                 | 1.8                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 5.7                                                                                 | 5.7                                                                                 | 5.7                                                                                 | 4.0                                                                                 | 5.7                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lead                                                                              | Lag                                                                                 | Lag                                                                                 | Lag                                                                                 | Lead                                                                                |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                               | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 |                                                                                     |                                                                                     |
| Recall Mode             | None                                                                              | None                                                                              |                                                                                   | None                                                                              | None                                                                              | None                                                                              | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               | None                                                                                | C-Min                                                                               |                                                                                     |
| Act Effect Green (s)    | 28.3                                                                              | 28.3                                                                              |                                                                                   | 28.3                                                                              | 28.3                                                                              | 50.2                                                                              | 40.1                                                                                | 40.1                                                                                | 40.1                                                                                | 61.7                                                                                | 60.0                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.28                                                                              | 0.28                                                                              |                                                                                   | 0.28                                                                              | 0.28                                                                              | 0.50                                                                              | 0.40                                                                                | 0.40                                                                                | 0.40                                                                                | 0.62                                                                                | 0.60                                                                                |                                                                                     |
| v/c Ratio               | 0.90                                                                              | 0.17                                                                              |                                                                                   | 0.36                                                                              | 0.20                                                                              | 0.66                                                                              | 0.22                                                                                | 0.69                                                                                | 0.11                                                                                | 0.76                                                                                | 0.70                                                                                |                                                                                     |
| Control Delay           | 62.3                                                                              | 20.1                                                                              |                                                                                   | 31.1                                                                              | 27.3                                                                              | 21.5                                                                              | 29.8                                                                                | 29.6                                                                                | 6.4                                                                                 | 36.7                                                                                | 7.7                                                                                 |                                                                                     |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.1                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.5                                                                                 |                                                                                     |
| Total Delay             | 62.3                                                                              | 20.1                                                                              |                                                                                   | 31.1                                                                              | 27.3                                                                              | 21.5                                                                              | 29.8                                                                                | 29.7                                                                                | 6.4                                                                                 | 36.7                                                                                | 8.2                                                                                 |                                                                                     |
| LOS                     | E                                                                                 | C                                                                                 |                                                                                   | C                                                                                 | C                                                                                 | C                                                                                 | C                                                                                   | C                                                                                   | A                                                                                   | D                                                                                   | A                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 53.0                                                                              |                                                                                   |                                                                                   | 24.1                                                                              |                                                                                   |                                                                                     | 28.2                                                                                |                                                                                     |                                                                                     | 13.0                                                                                |                                                                                     |
| Approach LOS            |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | C                                                                                 |                                                                                   |                                                                                     | C                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 188                                                                               | 31                                                                                |                                                                                   | 59                                                                                | 46                                                                                | 167                                                                               | 12                                                                                  | 277                                                                                 | 0                                                                                   | 114                                                                                 | 160                                                                                 |                                                                                     |
| Queue Length 95th (ft)  | #336                                                                              | 69                                                                                |                                                                                   | 110                                                                               | 87                                                                                | 264                                                                               | 37                                                                                  | 358                                                                                 | 29                                                                                  | 204                                                                                 | 194                                                                                 |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 291                                                                               |                                                                                   |                                                                                   | 261                                                                               |                                                                                   |                                                                                     | 534                                                                                 |                                                                                     |                                                                                     | 378                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 150                                                                               |                                                                                   |                                                                                   | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                 |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 392                                                                               | 572                                                                               |                                                                                   | 370                                                                               | 535                                                                               | 719                                                                               | 117                                                                                 | 1353                                                                                | 592                                                                                 | 429                                                                                 | 2052                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 226                                                                                 |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 23                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.82                                                                              | 0.16                                                                              |                                                                                   | 0.33                                                                              | 0.19                                                                              | 0.62                                                                              | 0.22                                                                                | 0.70                                                                                | 0.11                                                                                | 0.68                                                                                | 0.79                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 14 (14%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.90

Intersection Signal Delay: 23.3

Intersection LOS: C

Intersection Capacity Utilization 79.8%

ICU Level of Service D

Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 1: Divide Ave & Bismarck Expy



|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |                                                                                   |  |                                                                                   |                                                                                   |                                                                                   |                                                                                    |  |  |  |  |  |
| Volume (vph)            | 394                                                                               | 0                                                                                 | 529                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 1584                                                                                | 155                                                                                 | 35                                                                                  | 724                                                                                 | 0                                                                                   |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                 | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 200                                                                               |                                                                                   | 200                                                                               | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  |                                                                                     | 0                                                                                   | 222                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 2                                                                                 |                                                                                   | 2                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 300                                                                               | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                 |                                                                                     | 25                                                                                  | 150                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                    |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                    | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 575                                                                               |                                                                                   |                                                                                   | 383                                                                               |                                                                                   |                                                                                    | 458                                                                                 |                                                                                     |                                                                                     | 769                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 13.1                                                                              |                                                                                   |                                                                                   | 8.7                                                                               |                                                                                   |                                                                                    | 7.8                                                                                 |                                                                                     |                                                                                     | 13.1                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                               | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                               | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 3%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                 | 8%                                                                                  | 27%                                                                                 | 10%                                                                                 | 9%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 428                                                                               | 0                                                                                 | 575                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 1722                                                                                | 168                                                                                 | 38                                                                                  | 787                                                                                 | 0                                                                                   |
| Turn Type               | custom                                                                            |                                                                                   | custom                                                                            |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     | Perm                                                                                | Perm                                                                                |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     | 6                                                                                   | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                   | 6                                                                                   | 2                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               |                                                                                   | 6.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 21.1                                                                              |                                                                                   | 21.1                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 23.4                                                                                | 23.4                                                                                | 21.4                                                                                | 21.4                                                                                |                                                                                     |
| Total Split (s)         | 26.0                                                                              | 0.0                                                                               | 26.0                                                                              | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 74.0                                                                                | 74.0                                                                                | 74.0                                                                                | 74.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 26.0%                                                                             | 0.0%                                                                              | 26.0%                                                                             | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                               | 74.0%                                                                               | 74.0%                                                                               | 74.0%                                                                               | 74.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.6                                                                               |                                                                                   | 3.6                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 1.5                                                                               |                                                                                   | 1.5                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 1.5                                                                                 | 1.5                                                                                 | 1.5                                                                                 | 1.5                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 5.1                                                                               | 4.0                                                                               | 5.1                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                                | 5.4                                                                                 | 5.4                                                                                 | 5.4                                                                                 | 5.4                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Recall Mode             | None                                                                              |                                                                                   | None                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               |                                                                                     |
| Act Effct Green (s)     | 18.2                                                                              |                                                                                   | 18.2                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 71.3                                                                                | 71.3                                                                                | 71.3                                                                                | 71.3                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.18                                                                              |                                                                                   | 0.18                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.71                                                                                | 0.71                                                                                | 0.71                                                                                | 0.71                                                                                |                                                                                     |
| v/c Ratio               | 0.69                                                                              |                                                                                   | 0.67                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.72                                                                                | 0.18                                                                                | 0.34                                                                                | 0.33                                                                                |                                                                                     |
| Control Delay           | 44.1                                                                              |                                                                                   | 13.5                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 7.6                                                                                 | 1.2                                                                                 | 16.5                                                                                | 4.1                                                                                 |                                                                                     |
| Queue Delay             | 0.0                                                                               |                                                                                   | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.8                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |
| Total Delay             | 44.1                                                                              |                                                                                   | 13.5                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 8.3                                                                                 | 1.2                                                                                 | 16.5                                                                                | 4.1                                                                                 |                                                                                     |
| LOS                     | D                                                                                 |                                                                                   | B                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | A                                                                                   | A                                                                                   | B                                                                                   | A                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 7.7                                                                                 |                                                                                     |                                                                                     | 4.6                                                                                 |                                                                                     |
| Approach LOS            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | A                                                                                   |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 130                                                                               |                                                                                   | 44                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 137                                                                                 | 2                                                                                   | 3                                                                                   | 30                                                                                  |                                                                                     |
| Queue Length 95th (ft)  | 178                                                                               |                                                                                   | 103                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 201                                                                                 | m9                                                                                  | m50                                                                                 | 37                                                                                  |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 495                                                                               |                                                                                   |                                                                                   | 303                                                                               |                                                                                   |                                                                                    | 378                                                                                 |                                                                                     |                                                                                     | 689                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 200                                                                               |                                                                                   | 200                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | 222                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 711                                                                               |                                                                                   | 923                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 2382                                                                                | 955                                                                                 | 113                                                                                 | 2360                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 332                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.60                                                                              |                                                                                   | 0.62                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.84                                                                                | 0.18                                                                                | 0.34                                                                                | 0.33                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 8 (8%), Referenced to phase 2:SBTL and 6:NBT, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.72

Intersection Signal Delay: 12.1

Intersection LOS: B

Intersection Capacity Utilization 73.3%

ICU Level of Service D

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: South Ramp & Centennial Rd

|                                                                                        |                                                                                         |
|----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
|  ø2  |  ø4 |
| 74 s                                                                                   | 26 s                                                                                    |
|  ø6 |                                                                                         |
| 74 s                                                                                   |                                                                                         |

| Lane Group              | EBL  | EBT  | EBR  | WBL    | WBT  | WBR    | NBL   | NBT   | NBR  | SBL  | SBT   | SBR   |
|-------------------------|------|------|------|--------|------|--------|-------|-------|------|------|-------|-------|
| Lane Configurations     |      |      |      |        |      |        |       |       |      |      |       |       |
| Volume (vph)            | 0    | 0    | 0    | 92     | 0    | 19     | 528   | 1502  | 0    | 0    | 767   | 213   |
| Ideal Flow (vphpl)      | 1900 | 1900 | 1900 | 1900   | 1900 | 1900   | 1900  | 1900  | 1900 | 1900 | 1900  | 1900  |
| Lane Width (ft)         | 12   | 12   | 12   | 16     | 12   | 12     | 12    | 12    | 12   | 12   | 12    | 12    |
| Grade (%)               |      | 0%   |      |        | 0%   |        |       | 0%    |      |      | 0%    |       |
| Storage Length (ft)     | 0    |      | 0    | 0      |      | 150    | 215   |       | 0    | 0    |       | 200   |
| Storage Lanes           | 0    |      | 0    | 1      |      | 1      | 1     |       | 0    | 0    |       | 1     |
| Taper Length (ft)       | 25   |      | 25   | 25     |      | 100    | 150   |       | 25   | 25   |       | 25    |
| Right Turn on Red       |      |      | Yes  |        |      | Yes    |       |       | Yes  |      |       | Yes   |
| Link Speed (mph)        |      | 30   |      |        | 30   |        |       | 40    |      |      | 40    |       |
| Link Distance (ft)      |      | 270  |      |        | 465  |        |       | 769   |      |      | 793   |       |
| Travel Time (s)         |      | 6.1  |      |        | 10.6 |        |       | 13.1  |      |      | 13.5  |       |
| Confl. Peds. (#/hr)     |      |      |      |        |      |        |       |       |      |      |       |       |
| Confl. Bikes (#/hr)     |      |      |      |        |      |        |       |       |      |      |       |       |
| Peak Hour Factor        | 0.92 | 0.92 | 0.92 | 0.92   | 0.92 | 0.92   | 0.92  | 0.92  | 0.92 | 0.92 | 0.92  | 0.92  |
| Growth Factor           | 100% | 100% | 100% | 100%   | 100% | 100%   | 100%  | 100%  | 100% | 100% | 100%  | 100%  |
| Heavy Vehicles (%)      | 2%   | 2%   | 2%   | 12%    | 2%   | 8%     | 6%    | 3%    | 2%   | 2%   | 3%    | 1%    |
| Bus Blockages (#/hr)    | 0    | 0    | 0    | 0      | 0    | 0      | 0     | 0     | 0    | 0    | 0     | 0     |
| Parking (#/hr)          |      |      |      |        |      |        |       |       |      |      |       |       |
| Mid-Block Traffic (%)   |      | 0%   |      |        | 0%   |        |       | 0%    |      |      | 0%    |       |
| Shared Lane Traffic (%) |      |      |      |        |      |        |       |       |      |      |       |       |
| Lane Group Flow (vph)   | 0    | 0    | 0    | 100    | 0    | 21     | 574   | 1633  | 0    | 0    | 834   | 232   |
| Turn Type               |      |      |      | custom |      | custom | pm+pt |       |      |      |       | Perm  |
| Protected Phases        |      |      |      |        |      |        | 1     | 6     |      |      | 2     |       |
| Permitted Phases        |      |      |      | 8      |      | 8      | 6     |       |      |      |       | 2     |
| Detector Phase          |      |      |      | 8      |      | 8      | 1     | 6     |      |      | 2     | 2     |
| Switch Phase            |      |      |      |        |      |        |       |       |      |      |       |       |
| Minimum Initial (s)     |      |      |      | 5.0    |      | 5.0    | 5.0   | 10.0  |      |      | 10.0  | 10.0  |
| Minimum Split (s)       |      |      |      | 20.0   |      | 20.0   | 9.0   | 20.0  |      |      | 22.4  | 22.4  |
| Total Split (s)         | 0.0  | 0.0  | 0.0  | 20.0   | 0.0  | 20.0   | 41.0  | 80.0  | 0.0  | 0.0  | 39.0  | 39.0  |
| Total Split (%)         | 0.0% | 0.0% | 0.0% | 20.0%  | 0.0% | 20.0%  | 41.0% | 80.0% | 0.0% | 0.0% | 39.0% | 39.0% |
| Yellow Time (s)         |      |      |      | 3.2    |      | 3.2    | 3.0   | 3.9   |      |      | 3.9   | 3.9   |
| All-Red Time (s)        |      |      |      | 2.0    |      | 2.0    | 1.0   | 1.5   |      |      | 1.5   | 1.5   |
| Lost Time Adjust (s)    | 0.0  | 0.0  | 0.0  | 0.0    | 0.0  | 0.0    | 0.0   | 0.0   | 0.0  | 0.0  | 0.0   | 0.0   |
| Total Lost Time (s)     | 4.0  | 4.0  | 4.0  | 5.2    | 4.0  | 5.2    | 4.0   | 5.4   | 4.0  | 4.0  | 5.4   | 5.4   |
| Lead/Lag                |      |      |      |        |      |        | Lag   |       |      |      | Lead  | Lead  |
| Lead-Lag Optimize?      |      |      |      |        |      |        | Yes   |       |      |      | Yes   | Yes   |
| Recall Mode             |      |      |      | None   |      | None   | None  | C-Min |      |      | C-Min | C-Min |
| Act Effect Green (s)    |      |      |      | 9.8    |      | 9.8    | 83.1  | 82.8  |      |      | 43.4  | 43.4  |
| Actuated g/C Ratio      |      |      |      | 0.10   |      | 0.10   | 0.83  | 0.83  |      |      | 0.43  | 0.43  |
| v/c Ratio               |      |      |      | 0.56   |      | 0.13   | 0.72  | 0.56  |      |      | 0.55  | 0.28  |
| Control Delay           |      |      |      | 54.1   |      | 17.3   | 16.7  | 3.4   |      |      | 20.9  | 7.1   |
| Queue Delay             |      |      |      | 0.0    |      | 0.0    | 0.0   | 0.2   |      |      | 0.0   | 0.0   |
| Total Delay             |      |      |      | 54.1   |      | 17.3   | 16.7  | 3.6   |      |      | 20.9  | 7.1   |
| LOS                     |      |      |      | D      |      | B      | B     | A     |      |      | C     | A     |
| Approach Delay          |      |      |      |        |      |        |       | 7.0   |      |      | 17.9  |       |
| Approach LOS            |      |      |      |        |      |        |       | A     |      |      | B     |       |
| Queue Length 50th (ft)  |      |      |      | 62     |      | 0      | 106   | 107   |      |      | 232   | 27    |
| Queue Length 95th (ft)  |      |      |      | 110    |      | 22     | 239   | 142   |      |      | m277  | m53   |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 190                                                                               |                                                                                   |                                                                                   | 385                                                                               |                                                                                   |                                                                                    | 689                                                                                 |                                                                                     |                                                                                     | 713                                                                                 |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 150                                                                               | 215                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     | 200                                                                                 |
| Base Capacity (vph)     |                                                                                   |                                                                                   |                                                                                   | 270                                                                               |                                                                                   | 239                                                                               | 836                                                                                | 2903                                                                                |                                                                                     |                                                                                     | 1522                                                                                | 826                                                                                 |
| Starvation Cap Reductn  |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  | 223                                                                                 |                                                                                     |                                                                                     | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  | 463                                                                                 |                                                                                     |                                                                                     | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     |                                                                                     | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       |                                                                                   |                                                                                   |                                                                                   | 0.37                                                                              |                                                                                   | 0.09                                                                              | 0.69                                                                               | 0.67                                                                                |                                                                                     |                                                                                     | 0.55                                                                                | 0.28                                                                                |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 96 (96%), Referenced to phase 2:SBT and 6:NBTL, Start of Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.72

Intersection Signal Delay: 11.9

Intersection LOS: B

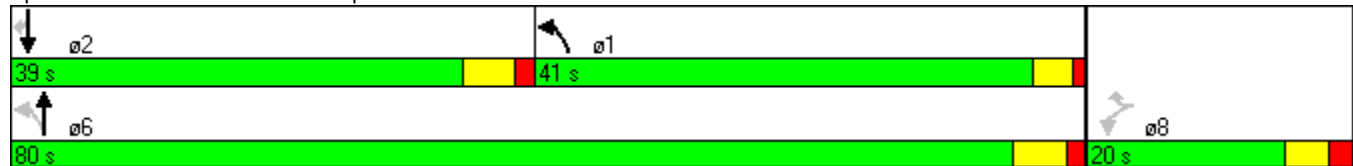
Intersection Capacity Utilization 73.3%

ICU Level of Service D

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: North Ramp & Centennial Rd



|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |                                                                                   |  |  |  |  |                                                                                   |  |  |                                                                                     |  |  |  |
| Volume (vph)            | 24                                                                                | 4                                                                                 | 149                                                                               | 206                                                                               | 2                                                                                 | 131                                                                               | 235                                                                                | 1866                                                                                | 338                                                                                 | 80                                                                                  | 853                                                                                 | 24                                                                                  |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                 | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 0                                                                                 |                                                                                   | 200                                                                               | 200                                                                               |                                                                                   | 200                                                                               | 530                                                                                |                                                                                     | 0                                                                                   | 215                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 0                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                  |                                                                                     | 0                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                 |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                    |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                    | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 681                                                                               |                                                                                   |                                                                                   | 921                                                                               |                                                                                   |                                                                                    | 793                                                                                 |                                                                                     |                                                                                     | 1295                                                                                |                                                                                     |
| Travel Time (s)         |                                                                                   | 15.5                                                                              |                                                                                   |                                                                                   | 20.9                                                                              |                                                                                   |                                                                                    | 13.5                                                                                |                                                                                     |                                                                                     | 22.1                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                               | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                               | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                 | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 0                                                                                 | 30                                                                                | 162                                                                               | 224                                                                               | 144                                                                               | 0                                                                                 | 255                                                                                | 2395                                                                                | 0                                                                                   | 87                                                                                  | 953                                                                                 | 0                                                                                   |
| Turn Type               | Perm                                                                              |                                                                                   | Perm                                                                              | Perm                                                                              |                                                                                   |                                                                                   | pm+pt                                                                              |                                                                                     |                                                                                     | pm+pt                                                                               |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 1                                                                                  | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 | 8                                                                                 |                                                                                   |                                                                                   | 6                                                                                  |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 | 4                                                                                 | 4                                                                                 | 8                                                                                 | 8                                                                                 |                                                                                   | 1                                                                                  | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               |                                                                                   | 5.0                                                                                | 4.0                                                                                 |                                                                                     | 5.0                                                                                 | 4.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              |                                                                                   | 9.0                                                                                | 20.0                                                                                |                                                                                     | 9.0                                                                                 | 20.0                                                                                |                                                                                     |
| Total Split (s)         | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 0.0                                                                               | 20.0                                                                               | 68.0                                                                                | 0.0                                                                                 | 12.0                                                                                | 60.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 20.0%                                                                             | 20.0%                                                                             | 20.0%                                                                             | 20.0%                                                                             | 20.0%                                                                             | 0.0%                                                                              | 20.0%                                                                              | 68.0%                                                                               | 0.0%                                                                                | 12.0%                                                                               | 60.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               |                                                                                   | 3.5                                                                                | 3.5                                                                                 |                                                                                     | 3.5                                                                                 | 3.5                                                                                 |                                                                                     |
| All-Red Time (s)        | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               |                                                                                   | 0.5                                                                                | 0.5                                                                                 |                                                                                     | 0.5                                                                                 | 0.5                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                                | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lead                                                                               | Lead                                                                                |                                                                                     | Lag                                                                                 | Lag                                                                                 |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                                | Yes                                                                                 |                                                                                     | Yes                                                                                 | Yes                                                                                 |                                                                                     |
| Recall Mode             | None                                                                              | None                                                                              | None                                                                              | None                                                                              | None                                                                              |                                                                                   | None                                                                               | C-Min                                                                               |                                                                                     | None                                                                                | C-Min                                                                               |                                                                                     |
| Act Effect Green (s)    |                                                                                   | 17.6                                                                              | 17.6                                                                              | 17.6                                                                              | 17.6                                                                              |                                                                                   | 65.1                                                                               | 65.1                                                                                |                                                                                     | 59.9                                                                                | 58.8                                                                                |                                                                                     |
| Actuated g/C Ratio      |                                                                                   | 0.18                                                                              | 0.18                                                                              | 0.18                                                                              | 0.18                                                                              |                                                                                   | 0.65                                                                               | 0.65                                                                                |                                                                                     | 0.60                                                                                | 0.59                                                                                |                                                                                     |
| v/c Ratio               |                                                                                   | 0.12                                                                              | 0.39                                                                              | 0.93                                                                              | 0.36                                                                              |                                                                                   | 0.62                                                                               | 1.06                                                                                |                                                                                     | 0.43                                                                                | 0.46                                                                                |                                                                                     |
| Control Delay           |                                                                                   | 37.6                                                                              | 9.2                                                                               | 85.2                                                                              | 9.8                                                                               |                                                                                   | 12.9                                                                               | 52.8                                                                                |                                                                                     | 22.1                                                                                | 7.1                                                                                 |                                                                                     |
| Queue Delay             |                                                                                   | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                                | 0.0                                                                                 |                                                                                     | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |
| Total Delay             |                                                                                   | 37.6                                                                              | 9.2                                                                               | 85.2                                                                              | 9.8                                                                               |                                                                                   | 12.9                                                                               | 52.8                                                                                |                                                                                     | 22.1                                                                                | 7.1                                                                                 |                                                                                     |
| LOS                     |                                                                                   | D                                                                                 | A                                                                                 | F                                                                                 | A                                                                                 |                                                                                   | B                                                                                  | D                                                                                   |                                                                                     | C                                                                                   | A                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 13.6                                                                              |                                                                                   |                                                                                   | 55.7                                                                              |                                                                                   |                                                                                    | 48.9                                                                                |                                                                                     |                                                                                     | 8.3                                                                                 |                                                                                     |
| Approach LOS            |                                                                                   | B                                                                                 |                                                                                   |                                                                                   | E                                                                                 |                                                                                   |                                                                                    | D                                                                                   |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |
| Queue Length 50th (ft)  |                                                                                   | 17                                                                                | 0                                                                                 | ~148                                                                              | 2                                                                                 |                                                                                   | 57                                                                                 | ~909                                                                                |                                                                                     | 12                                                                                  | 73                                                                                  |                                                                                     |
| Queue Length 95th (ft)  |                                                                                   | 44                                                                                | 56                                                                                | #300                                                                              | 55                                                                                |                                                                                   | 93                                                                                 | #1028                                                                               |                                                                                     | m47                                                                                 | 76                                                                                  |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 601                                                                               |                                                                                   |                                                                                   | 841                                                                               |                                                                                   |                                                                                    | 713                                                                                 |                                                                                     |                                                                                     | 1215                                                                                |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   | 200                                                                               | 200                                                                               |                                                                                   |                                                                                   | 530                                                                                |                                                                                     |                                                                                     | 215                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     |                                                                                   | 245                                                                               | 411                                                                               | 242                                                                               | 395                                                                               |                                                                                   | 474                                                                                | 2265                                                                                |                                                                                     | 216                                                                                 | 2074                                                                                |                                                                                     |
| Starvation Cap Reductn  |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       |                                                                                   | 0.12                                                                              | 0.39                                                                              | 0.93                                                                              | 0.36                                                                              |                                                                                   | 0.54                                                                               | 1.06                                                                                |                                                                                     | 0.40                                                                                | 0.46                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 40 (40%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 110

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.06

Intersection Signal Delay: 38.0

Intersection LOS: D

Intersection Capacity Utilization 94.9%

ICU Level of Service F

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Trenton Dr & Centennial Rd

|                                                                                        |                                                                                          |                                                                                          |
|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
|  ø1 |  ø2   |  ø4 |
| 20 s                                                                                   | 60 s                                                                                     | 20 s                                                                                     |
|  ø6 |  ø5 |  ø8 |
| 68 s                                                                                   | 12 s                                                                                     | 20 s                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |  |  |  |  |  |  |                                                                                     |  |  |  |
| Volume (vph)            | 98                                                                                | 300                                                                               | 253                                                                               | 238                                                                               | 191                                                                               | 47                                                                                | 243                                                                                 | 771                                                                                 | 331                                                                                 | 70                                                                                  | 483                                                                                 | 60                                                                                  |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                                 |                                                                                     | 0                                                                                   | 215                                                                                 |                                                                                     | 215                                                                                 |
| Storage Lanes           | 1                                                                                 |                                                                                   | 1                                                                                 | 2                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                   |                                                                                     | 0                                                                                   | 1                                                                                   |                                                                                     | 1                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                  |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 35                                                                                |                                                                                   |                                                                                   | 35                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 682                                                                               |                                                                                   |                                                                                   | 662                                                                               |                                                                                   |                                                                                     | 1295                                                                                |                                                                                     |                                                                                     | 520                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 13.3                                                                              |                                                                                   |                                                                                   | 12.9                                                                              |                                                                                   |                                                                                     | 22.1                                                                                |                                                                                     |                                                                                     | 8.9                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 107                                                                               | 326                                                                               | 275                                                                               | 259                                                                               | 208                                                                               | 51                                                                                | 264                                                                                 | 1198                                                                                | 0                                                                                   | 76                                                                                  | 525                                                                                 | 65                                                                                  |
| Turn Type               | pm+pt                                                                             |                                                                                   | Perm                                                                              | pm+pt                                                                             |                                                                                   | Perm                                                                              | pm+pt                                                                               |                                                                                     |                                                                                     | pm+pt                                                                               |                                                                                     | Perm                                                                                |
| Protected Phases        | 7                                                                                 | 4                                                                                 |                                                                                   | 3                                                                                 | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     | 2                                                                                   |
| Detector Phase          | 7                                                                                 | 4                                                                                 | 4                                                                                 | 3                                                                                 | 8                                                                                 | 8                                                                                 | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   | 2                                                                                   |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 4.0                                                                               | 10.0                                                                              | 10.0                                                                              | 4.0                                                                               | 10.0                                                                              | 10.0                                                                              | 4.0                                                                                 | 6.0                                                                                 |                                                                                     | 4.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 |
| Minimum Split (s)       | 8.0                                                                               | 15.7                                                                              | 15.7                                                                              | 8.0                                                                               | 15.7                                                                              | 15.7                                                                              | 8.0                                                                                 | 11.5                                                                                |                                                                                     | 8.0                                                                                 | 11.5                                                                                | 11.5                                                                                |
| Total Split (s)         | 12.0                                                                              | 23.5                                                                              | 23.5                                                                              | 12.0                                                                              | 23.5                                                                              | 23.5                                                                              | 17.0                                                                                | 52.5                                                                                | 0.0                                                                                 | 12.0                                                                                | 47.5                                                                                | 47.5                                                                                |
| Total Split (%)         | 12.0%                                                                             | 23.5%                                                                             | 23.5%                                                                             | 12.0%                                                                             | 23.5%                                                                             | 23.5%                                                                             | 17.0%                                                                               | 52.5%                                                                               | 0.0%                                                                                | 12.0%                                                                               | 47.5%                                                                               | 47.5%                                                                               |
| Yellow Time (s)         | 3.5                                                                               | 3.9                                                                               | 3.9                                                                               | 3.5                                                                               | 3.9                                                                               | 3.9                                                                               | 3.5                                                                                 | 3.6                                                                                 |                                                                                     | 3.5                                                                                 | 3.6                                                                                 | 3.6                                                                                 |
| All-Red Time (s)        | 0.5                                                                               | 1.8                                                                               | 1.8                                                                               | 0.5                                                                               | 1.8                                                                               | 1.8                                                                               | 0.5                                                                                 | 1.9                                                                                 |                                                                                     | 0.5                                                                                 | 1.9                                                                                 | 1.9                                                                                 |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 5.7                                                                               | 5.7                                                                               | 4.0                                                                               | 5.7                                                                               | 5.7                                                                               | 4.0                                                                                 | 5.5                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 5.5                                                                                 | 5.5                                                                                 |
| Lead/Lag                | Lag                                                                               | Lead                                                                              | Lead                                                                              | Lag                                                                               | Lead                                                                              | Lead                                                                              | Lag                                                                                 | Lead                                                                                |                                                                                     | Lag                                                                                 | Lead                                                                                | Lead                                                                                |
| Lead-Lag Optimize?      | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                                 | Yes                                                                                 |                                                                                     | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 |
| Recall Mode             | None                                                                              | Max                                                                               | Max                                                                               | None                                                                              | Max                                                                               | Max                                                                               | None                                                                                | C-Max                                                                               |                                                                                     | None                                                                                | C-Max                                                                               | C-Max                                                                               |
| Act Effect Green (s)    | 25.5                                                                              | 17.8                                                                              | 17.8                                                                              | 25.5                                                                              | 17.8                                                                              | 17.8                                                                              | 62.5                                                                                | 52.7                                                                                |                                                                                     | 54.5                                                                                | 46.8                                                                                | 46.8                                                                                |
| Actuated g/C Ratio      | 0.26                                                                              | 0.18                                                                              | 0.18                                                                              | 0.26                                                                              | 0.18                                                                              | 0.18                                                                              | 0.62                                                                                | 0.53                                                                                |                                                                                     | 0.54                                                                                | 0.47                                                                                | 0.47                                                                                |
| v/c Ratio               | 0.32                                                                              | 0.52                                                                              | 0.54                                                                              | 0.49                                                                              | 0.33                                                                              | 0.16                                                                              | 0.45                                                                                | 0.66                                                                                |                                                                                     | 0.33                                                                                | 0.32                                                                                | 0.08                                                                                |
| Control Delay           | 30.7                                                                              | 40.6                                                                              | 8.9                                                                               | 33.3                                                                              | 37.6                                                                              | 11.4                                                                              | 3.7                                                                                 | 6.1                                                                                 |                                                                                     | 17.8                                                                                | 17.8                                                                                | 4.6                                                                                 |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 |                                                                                     | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             | 30.7                                                                              | 40.6                                                                              | 8.9                                                                               | 33.3                                                                              | 37.6                                                                              | 11.4                                                                              | 3.7                                                                                 | 6.1                                                                                 |                                                                                     | 17.8                                                                                | 17.8                                                                                | 4.6                                                                                 |
| LOS                     | C                                                                                 | D                                                                                 | A                                                                                 | C                                                                                 | D                                                                                 | B                                                                                 | A                                                                                   | A                                                                                   |                                                                                     | B                                                                                   | B                                                                                   | A                                                                                   |
| Approach Delay          |                                                                                   | 26.8                                                                              |                                                                                   |                                                                                   | 32.9                                                                              |                                                                                   |                                                                                     | 5.6                                                                                 |                                                                                     |                                                                                     | 16.5                                                                                |                                                                                     |
| Approach LOS            |                                                                                   | C                                                                                 |                                                                                   |                                                                                   | C                                                                                 |                                                                                   |                                                                                     | A                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 51                                                                                | 100                                                                               | 0                                                                                 | 64                                                                                | 61                                                                                | 0                                                                                 | 14                                                                                  | 97                                                                                  |                                                                                     | 17                                                                                  | 107                                                                                 | 0                                                                                   |
| Queue Length 95th (ft)  | 93                                                                                | 144                                                                               | 70                                                                                | 96                                                                                | 96                                                                                | 32                                                                                | m28                                                                                 | m137                                                                                |                                                                                     | 36                                                                                  | 155                                                                                 | 24                                                                                  |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 602                                                                               |                                                                                   |                                                                                   | 582                                                                               |                                                                                   |                                                                                    | 1215                                                                                |                                                                                     |                                                                                     | 440                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                                |                                                                                     |                                                                                     | 215                                                                                 |                                                                                     | 215                                                                                 |
| Base Capacity (vph)     | 367                                                                               | 630                                                                               | 508                                                                               | 600                                                                               | 630                                                                               | 324                                                                               | 638                                                                                | 1823                                                                                |                                                                                     | 258                                                                                 | 1655                                                                                | 775                                                                                 |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       | 0.29                                                                              | 0.52                                                                              | 0.54                                                                              | 0.43                                                                              | 0.33                                                                              | 0.16                                                                              | 0.41                                                                               | 0.66                                                                                |                                                                                     | 0.29                                                                                | 0.32                                                                                | 0.08                                                                                |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 54 (54%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.66

Intersection Signal Delay: 16.5

Intersection LOS: B

Intersection Capacity Utilization 66.9%

ICU Level of Service C

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: Century Ave & Centennial Rd

|                                                                                        |                                                                                        |                                                                                         |                                                                                          |
|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
|  ø2  |  ø1  |  ø4  |  ø3  |
| 47.5 s                                                                                 | 17 s                                                                                   | 23.5 s                                                                                  | 12 s                                                                                     |
|  ø6 |  ø5 |  ø8 |  ø7 |
| 52.5 s                                                                                 | 12 s                                                                                   | 23.5 s                                                                                  | 12 s                                                                                     |



**Appendix T: 2035 - Signal at Trenton & NE Loop Ramp AM (3C1)**

Exit 161 Operational Study  
Bismarck, ND

1: Divide Ave & Bismarck Expy

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |                                                                                   |  |  |  |  |  |  |  |  |  |
| Volume (vph)            | 116                                                                               | 125                                                                               | 18                                                                                | 141                                                                               | 96                                                                                | 328                                                                               | 25                                                                                  | 430                                                                                 | 72                                                                                  | 428                                                                                 | 1468                                                                                | 328                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 150                                                                               |                                                                                   | 0                                                                                 | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                 |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                   |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 100                                                                               |                                                                                   | 25                                                                                | 100                                                                               |                                                                                   | 100                                                                               | 100                                                                                 |                                                                                     | 150                                                                                 | 100                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 25                                                                                |                                                                                   |                                                                                   | 25                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 371                                                                               |                                                                                   |                                                                                   | 341                                                                               |                                                                                   |                                                                                     | 614                                                                                 |                                                                                     |                                                                                     | 458                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 10.1                                                                              |                                                                                   |                                                                                   | 9.3                                                                               |                                                                                   |                                                                                     | 10.5                                                                                |                                                                                     |                                                                                     | 7.8                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 4%                                                                                | 1%                                                                                | 1%                                                                                | 11%                                                                               | 10%                                                                               | 22%                                                                               | 10%                                                                                 | 7%                                                                                  | 17%                                                                                 | 11%                                                                                 | 4%                                                                                  | 4%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 126                                                                               | 156                                                                               | 0                                                                                 | 153                                                                               | 104                                                                               | 357                                                                               | 27                                                                                  | 467                                                                                 | 78                                                                                  | 465                                                                                 | 1953                                                                                | 0                                                                                   |
| Turn Type               | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                              |                                                                                   | pm+ov                                                                             | Perm                                                                                |                                                                                     | Perm                                                                                | pm+pt                                                                               |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 | 5                                                                                 |                                                                                     | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                   |                                                                                     | 6                                                                                   | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 | 4                                                                                 |                                                                                   | 8                                                                                 | 8                                                                                 | 5                                                                                 | 6                                                                                   | 6                                                                                   | 6                                                                                   | 5                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               | 6.0                                                                               |                                                                                   | 6.0                                                                               | 6.0                                                                               | 5.0                                                                               | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 5.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 30.0                                                                              | 30.0                                                                              |                                                                                   | 30.0                                                                              | 30.0                                                                              | 9.8                                                                               | 22.9                                                                                | 22.9                                                                                | 22.9                                                                                | 9.8                                                                                 | 28.7                                                                                |                                                                                     |
| Total Split (s)         | 30.0                                                                              | 30.0                                                                              | 0.0                                                                               | 30.0                                                                              | 30.0                                                                              | 24.1                                                                              | 45.9                                                                                | 45.9                                                                                | 45.9                                                                                | 24.1                                                                                | 70.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 30.0%                                                                             | 30.0%                                                                             | 0.0%                                                                              | 30.0%                                                                             | 30.0%                                                                             | 24.1%                                                                             | 45.9%                                                                               | 45.9%                                                                               | 45.9%                                                                               | 24.1%                                                                               | 70.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 3.0                                                                               | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 | 3.0                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 1.0                                                                               | 1.8                                                                                 | 1.8                                                                                 | 1.8                                                                                 | 1.0                                                                                 | 1.8                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 5.7                                                                                 | 5.7                                                                                 | 5.7                                                                                 | 4.0                                                                                 | 5.7                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lead                                                                              | Lag                                                                                 | Lag                                                                                 | Lag                                                                                 | Lead                                                                                |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                               | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 |                                                                                     |                                                                                     |
| Recall Mode             | None                                                                              | None                                                                              |                                                                                   | None                                                                              | None                                                                              | None                                                                              | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               | None                                                                                | C-Min                                                                               |                                                                                     |
| Act Effect Green (s)    | 18.6                                                                              | 18.6                                                                              |                                                                                   | 18.6                                                                              | 18.6                                                                              | 41.3                                                                              | 49.0                                                                                | 49.0                                                                                | 49.0                                                                                | 71.4                                                                                | 69.7                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.19                                                                              | 0.19                                                                              |                                                                                   | 0.19                                                                              | 0.19                                                                              | 0.41                                                                              | 0.49                                                                                | 0.49                                                                                | 0.49                                                                                | 0.71                                                                                | 0.70                                                                                |                                                                                     |
| v/c Ratio               | 0.54                                                                              | 0.45                                                                              |                                                                                   | 0.81                                                                              | 0.32                                                                              | 0.52                                                                              | 0.39                                                                                | 0.28                                                                                | 0.11                                                                                | 0.69                                                                                | 0.82                                                                                |                                                                                     |
| Control Delay           | 44.2                                                                              | 37.3                                                                              |                                                                                   | 67.7                                                                              | 36.4                                                                              | 8.5                                                                               | 42.6                                                                                | 17.5                                                                                | 4.9                                                                                 | 11.2                                                                                | 12.3                                                                                |                                                                                     |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.5                                                                                 |                                                                                     |
| Total Delay             | 44.2                                                                              | 37.3                                                                              |                                                                                   | 67.7                                                                              | 36.4                                                                              | 8.5                                                                               | 42.6                                                                                | 17.5                                                                                | 4.9                                                                                 | 11.2                                                                                | 12.8                                                                                |                                                                                     |
| LOS                     | D                                                                                 | D                                                                                 |                                                                                   | E                                                                                 | D                                                                                 | A                                                                                 | D                                                                                   | B                                                                                   | A                                                                                   | B                                                                                   | B                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 40.4                                                                              |                                                                                   |                                                                                   | 28.0                                                                              |                                                                                   |                                                                                     | 17.0                                                                                |                                                                                     |                                                                                     | 12.5                                                                                |                                                                                     |
| Approach LOS            |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | C                                                                                 |                                                                                   |                                                                                     | B                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 72                                                                                | 84                                                                                |                                                                                   | 93                                                                                | 57                                                                                | 45                                                                                | 11                                                                                  | 94                                                                                  | 0                                                                                   | 96                                                                                  | 337                                                                                 |                                                                                     |
| Queue Length 95th (ft)  | 125                                                                               | 137                                                                               |                                                                                   | #162                                                                              | 101                                                                               | 104                                                                               | #55                                                                                 | 146                                                                                 | 28                                                                                  | 180                                                                                 | 386                                                                                 |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 291                                                                               |                                                                                   |                                                                                   | 261                                                                               |                                                                                   |                                                                                    | 534                                                                                 |                                                                                     |                                                                                     | 378                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 150                                                                               |                                                                                   |                                                                                   | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 303                                                                               | 448                                                                               |                                                                                   | 245                                                                               | 414                                                                               | 727                                                                               | 70                                                                                 | 1652                                                                                | 715                                                                                 | 702                                                                                 | 2369                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 2                                                                                   | 130                                                                                 |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.42                                                                              | 0.35                                                                              |                                                                                   | 0.62                                                                              | 0.25                                                                              | 0.49                                                                              | 0.39                                                                               | 0.28                                                                                | 0.11                                                                                | 0.66                                                                                | 0.87                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 38 (38%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.82

Intersection Signal Delay: 17.6

Intersection LOS: B

Intersection Capacity Utilization 91.0%

ICU Level of Service F

Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 1: Divide Ave & Bismarck Expy

|                                                                                     |    |  |  |                                                                                     |    |  |  |  |  |                                                                                       |    |
|-------------------------------------------------------------------------------------|----|--|--|-------------------------------------------------------------------------------------|----|--|--|--|--|---------------------------------------------------------------------------------------|----|
|  | ø2 |  |  |                                                                                     |    |  |  |  |  |  | ø4 |
| 70 s                                                                                |    |  |  |                                                                                     |    |  |  |  |  | 30 s                                                                                  |    |
|  | ø5 |  |  |  | ø6 |  |  |  |  |  | ø8 |
| 24.1 s                                                                              |    |  |  | 45.9 s                                                                              |    |  |  |  |  | 30 s                                                                                  |    |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |                                                                                   |  |                                                                                   |                                                                                   |                                                                                   |                                                                                    |  |  |  |  |  |
| Volume (vph)            | 178                                                                               | 0                                                                                 | 720                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 788                                                                                 | 115                                                                                 | 30                                                                                  | 1178                                                                                | 0                                                                                   |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                 | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 200                                                                               |                                                                                   | 200                                                                               | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  |                                                                                     | 0                                                                                   | 222                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 2                                                                                 |                                                                                   | 2                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 300                                                                               | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                 |                                                                                     | 25                                                                                  | 150                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                    |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                    | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 575                                                                               |                                                                                   |                                                                                   | 383                                                                               |                                                                                   |                                                                                    | 458                                                                                 |                                                                                     |                                                                                     | 769                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 13.1                                                                              |                                                                                   |                                                                                   | 8.7                                                                               |                                                                                   |                                                                                    | 7.8                                                                                 |                                                                                     |                                                                                     | 13.1                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                               | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                               | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 3%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                 | 8%                                                                                  | 27%                                                                                 | 10%                                                                                 | 9%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 193                                                                               | 0                                                                                 | 783                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 857                                                                                 | 125                                                                                 | 33                                                                                  | 1280                                                                                | 0                                                                                   |
| Turn Type               | custom                                                                            |                                                                                   | custom                                                                            |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     | Perm                                                                                | Perm                                                                                |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     | 6                                                                                   | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                   | 6                                                                                   | 2                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               |                                                                                   | 6.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 21.1                                                                              |                                                                                   | 21.1                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 23.4                                                                                | 23.4                                                                                | 21.4                                                                                | 21.4                                                                                |                                                                                     |
| Total Split (s)         | 42.0                                                                              | 0.0                                                                               | 42.0                                                                              | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 58.0                                                                                | 58.0                                                                                | 58.0                                                                                | 58.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 42.0%                                                                             | 0.0%                                                                              | 42.0%                                                                             | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                               | 58.0%                                                                               | 58.0%                                                                               | 58.0%                                                                               | 58.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.6                                                                               |                                                                                   | 3.6                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 1.5                                                                               |                                                                                   | 1.5                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 1.5                                                                                 | 1.5                                                                                 | 1.5                                                                                 | 1.5                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 5.1                                                                               | 4.0                                                                               | 5.1                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                                | 5.4                                                                                 | 5.4                                                                                 | 5.4                                                                                 | 5.4                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Recall Mode             | None                                                                              |                                                                                   | None                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               |                                                                                     |
| Act Effct Green (s)     | 31.5                                                                              |                                                                                   | 31.5                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 58.0                                                                                | 58.0                                                                                | 58.0                                                                                | 58.0                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.32                                                                              |                                                                                   | 0.32                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.58                                                                                | 0.58                                                                                | 0.58                                                                                | 0.58                                                                                |                                                                                     |
| v/c Ratio               | 0.18                                                                              |                                                                                   | 0.84                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.44                                                                                | 0.16                                                                                | 0.12                                                                                | 0.67                                                                                |                                                                                     |
| Control Delay           | 24.2                                                                              |                                                                                   | 37.6                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 12.3                                                                                | 3.9                                                                                 | 7.2                                                                                 | 10.4                                                                                |                                                                                     |
| Queue Delay             | 0.0                                                                               |                                                                                   | 0.2                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.1                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.1                                                                                 |                                                                                     |
| Total Delay             | 24.2                                                                              |                                                                                   | 37.8                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 12.4                                                                                | 3.9                                                                                 | 7.2                                                                                 | 10.6                                                                                |                                                                                     |
| LOS                     | C                                                                                 |                                                                                   | D                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | B                                                                                   | A                                                                                   | A                                                                                   | B                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 11.3                                                                                |                                                                                     |                                                                                     | 10.5                                                                                |                                                                                     |
| Approach LOS            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | B                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 45                                                                                |                                                                                   | 238                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 117                                                                                 | 5                                                                                   | 6                                                                                   | 180                                                                                 |                                                                                     |
| Queue Length 95th (ft)  | 66                                                                                |                                                                                   | 298                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 163                                                                                 | 21                                                                                  | m9                                                                                  | 319                                                                                 |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 495                                                                               |                                                                                   |                                                                                   | 303                                                                               |                                                                                   |                                                                                    | 378                                                                                 |                                                                                     |                                                                                     | 689                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 200                                                                               |                                                                                   | 200                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | 222                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 1255                                                                              |                                                                                   | 1074                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 1938                                                                                | 790                                                                                 | 281                                                                                 | 1920                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 310                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 |                                                                                   | 29                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 104                                                                                 |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.15                                                                              |                                                                                   | 0.75                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.53                                                                                | 0.16                                                                                | 0.12                                                                                | 0.70                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 32 (32%), Referenced to phase 2:SBTL and 6:NBT, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.84

Intersection Signal Delay: 18.1

Intersection LOS: B

Intersection Capacity Utilization 66.5%

ICU Level of Service C

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: South Ramp & Centennial Rd

|                                                                                     |    |  |                                                                                    |    |
|-------------------------------------------------------------------------------------|----|--|------------------------------------------------------------------------------------|----|
|   | ø2 |  |  | ø4 |
| 58 s                                                                                |    |  | 42 s                                                                               |    |
|  | ø6 |  |                                                                                    |    |
| 58 s                                                                                |    |  |                                                                                    |    |

|                         |  |      |      |                                                                                   |      |                                                                                     |      |                                                                                     |                                                                                     |      |                                                                                     |                                                                                     |
|-------------------------|------------------------------------------------------------------------------------|------|------|-----------------------------------------------------------------------------------|------|-------------------------------------------------------------------------------------|------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                                | EBT  | EBR  | WBL                                                                               | WBT  | WBR                                                                                 | NBL  | NBT                                                                                 | NBR                                                                                 | SBL  | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |                                                                                    |      |      |  |      |  |      |  |  |      |  |  |
| Volume (vph)            | 0                                                                                  | 0    | 0    | 175                                                                               | 0    | 17                                                                                  | 0    | 605                                                                                 | 471                                                                                 | 0    | 1949                                                                                | 435                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                               | 1900 | 1900 | 1900                                                                              | 1900 | 1900                                                                                | 1900 | 1900                                                                                | 1900                                                                                | 1900 | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                 | 12   | 12   | 16                                                                                | 12   | 12                                                                                  | 12   | 12                                                                                  | 12                                                                                  | 12   | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                    | 0%   |      |                                                                                   | 0%   |                                                                                     |      | 0%                                                                                  |                                                                                     |      | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 0                                                                                  |      | 0    | 0                                                                                 |      | 150                                                                                 | 0    |                                                                                     | 215                                                                                 | 0    |                                                                                     | 200                                                                                 |
| Storage Lanes           | 0                                                                                  |      | 0    | 1                                                                                 |      | 1                                                                                   | 0    |                                                                                     | 1                                                                                   | 0    |                                                                                     | 1                                                                                   |
| Taper Length (ft)       | 25                                                                                 |      | 25   | 25                                                                                |      | 100                                                                                 | 150  |                                                                                     | 25                                                                                  | 25   |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                    |      | Yes  |                                                                                   |      | Yes                                                                                 |      |                                                                                     | Yes                                                                                 |      |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                    | 30   |      |                                                                                   | 30   |                                                                                     |      | 40                                                                                  |                                                                                     |      | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                    | 270  |      |                                                                                   | 465  |                                                                                     |      | 769                                                                                 |                                                                                     |      | 776                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                    | 6.1  |      |                                                                                   | 10.6 |                                                                                     |      | 13.1                                                                                |                                                                                     |      | 13.2                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                    |      |      |                                                                                   |      |                                                                                     |      |                                                                                     |                                                                                     |      |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                    |      |      |                                                                                   |      |                                                                                     |      |                                                                                     |                                                                                     |      |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                               | 0.92 | 0.92 | 0.92                                                                              | 0.92 | 0.92                                                                                | 0.92 | 0.92                                                                                | 0.92                                                                                | 0.92 | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                               | 100% | 100% | 100%                                                                              | 100% | 100%                                                                                | 100% | 100%                                                                                | 100%                                                                                | 100% | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                 | 2%   | 2%   | 12%                                                                               | 2%   | 8%                                                                                  | 6%   | 3%                                                                                  | 2%                                                                                  | 2%   | 3%                                                                                  | 1%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                  | 0    | 0    | 0                                                                                 | 0    | 0                                                                                   | 0    | 0                                                                                   | 0                                                                                   | 0    | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                    |      |      |                                                                                   |      |                                                                                     |      |                                                                                     |                                                                                     |      |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                    | 0%   |      |                                                                                   | 0%   |                                                                                     |      | 0%                                                                                  |                                                                                     |      | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                    |      |      |                                                                                   |      |                                                                                     |      |                                                                                     |                                                                                     |      |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 0                                                                                  | 0    | 0    | 190                                                                               | 0    | 18                                                                                  | 0    | 658                                                                                 | 512                                                                                 | 0    | 2118                                                                                | 473                                                                                 |
| Turn Type               |                                                                                    |      |      | custom                                                                            |      | custom                                                                              |      |                                                                                     | Free                                                                                |      |                                                                                     | Perm                                                                                |
| Protected Phases        |                                                                                    |      |      |                                                                                   |      |                                                                                     |      | 6                                                                                   |                                                                                     |      | 2                                                                                   |                                                                                     |
| Permitted Phases        |                                                                                    |      |      | 8                                                                                 |      | 8                                                                                   |      |                                                                                     | Free                                                                                |      |                                                                                     | 2                                                                                   |
| Detector Phase          |                                                                                    |      |      | 8                                                                                 |      | 8                                                                                   |      | 6                                                                                   |                                                                                     |      | 2                                                                                   | 2                                                                                   |
| Switch Phase            |                                                                                    |      |      |                                                                                   |      |                                                                                     |      |                                                                                     |                                                                                     |      |                                                                                     |                                                                                     |
| Minimum Initial (s)     |                                                                                    |      |      | 5.0                                                                               |      | 5.0                                                                                 |      | 10.0                                                                                |                                                                                     |      | 10.0                                                                                | 10.0                                                                                |
| Minimum Split (s)       |                                                                                    |      |      | 20.0                                                                              |      | 20.0                                                                                |      | 20.0                                                                                |                                                                                     |      | 22.4                                                                                | 22.4                                                                                |
| Total Split (s)         | 0.0                                                                                | 0.0  | 0.0  | 21.0                                                                              | 0.0  | 21.0                                                                                | 0.0  | 79.0                                                                                | 0.0                                                                                 | 0.0  | 79.0                                                                                | 79.0                                                                                |
| Total Split (%)         | 0.0%                                                                               | 0.0% | 0.0% | 21.0%                                                                             | 0.0% | 21.0%                                                                               | 0.0% | 79.0%                                                                               | 0.0%                                                                                | 0.0% | 79.0%                                                                               | 79.0%                                                                               |
| Yellow Time (s)         |                                                                                    |      |      | 3.2                                                                               |      | 3.2                                                                                 |      | 3.9                                                                                 |                                                                                     |      | 3.9                                                                                 | 3.9                                                                                 |
| All-Red Time (s)        |                                                                                    |      |      | 2.0                                                                               |      | 2.0                                                                                 |      | 1.5                                                                                 |                                                                                     |      | 1.5                                                                                 | 1.5                                                                                 |
| Lost Time Adjust (s)    | 0.0                                                                                | 0.0  | 0.0  | 0.0                                                                               | 0.0  | 0.0                                                                                 | 0.0  | 0.0                                                                                 | 0.0                                                                                 | 0.0  | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                                | 4.0  | 4.0  | 5.2                                                                               | 4.0  | 5.2                                                                                 | 4.0  | 5.4                                                                                 | 4.0                                                                                 | 4.0  | 5.4                                                                                 | 5.4                                                                                 |
| Lead/Lag                |                                                                                    |      |      |                                                                                   |      |                                                                                     |      |                                                                                     |                                                                                     |      |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                    |      |      |                                                                                   |      |                                                                                     |      |                                                                                     |                                                                                     |      |                                                                                     |                                                                                     |
| Recall Mode             |                                                                                    |      |      | None                                                                              |      | None                                                                                |      | C-Min                                                                               |                                                                                     |      | C-Min                                                                               | C-Min                                                                               |
| Act Effect Green (s)    |                                                                                    |      |      | 13.6                                                                              |      | 13.6                                                                                |      | 75.8                                                                                | 100.0                                                                               |      | 75.8                                                                                | 75.8                                                                                |
| Actuated g/C Ratio      |                                                                                    |      |      | 0.14                                                                              |      | 0.14                                                                                |      | 0.76                                                                                | 1.00                                                                                |      | 0.76                                                                                | 0.76                                                                                |
| v/c Ratio               |                                                                                    |      |      | 0.77                                                                              |      | 0.08                                                                                |      | 0.25                                                                                | 0.32                                                                                |      | 0.80                                                                                | 0.36                                                                                |
| Control Delay           |                                                                                    |      |      | 61.4                                                                              |      | 16.5                                                                                |      | 2.5                                                                                 | 0.6                                                                                 |      | 2.3                                                                                 | 0.4                                                                                 |
| Queue Delay             |                                                                                    |      |      | 0.0                                                                               |      | 0.0                                                                                 |      | 0.0                                                                                 | 0.0                                                                                 |      | 0.3                                                                                 | 0.0                                                                                 |
| Total Delay             |                                                                                    |      |      | 61.4                                                                              |      | 16.5                                                                                |      | 2.5                                                                                 | 0.6                                                                                 |      | 2.6                                                                                 | 0.4                                                                                 |
| LOS                     |                                                                                    |      |      | E                                                                                 |      | B                                                                                   |      | A                                                                                   | A                                                                                   |      | A                                                                                   | A                                                                                   |
| Approach Delay          |                                                                                    |      |      |                                                                                   |      |                                                                                     |      | 1.6                                                                                 |                                                                                     |      | 2.2                                                                                 |                                                                                     |
| Approach LOS            |                                                                                    |      |      |                                                                                   |      |                                                                                     |      | A                                                                                   |                                                                                     |      | A                                                                                   |                                                                                     |
| Queue Length 50th (ft)  |                                                                                    |      |      | 117                                                                               |      | 0                                                                                   |      | 34                                                                                  | 0                                                                                   |      | 111                                                                                 | 2                                                                                   |
| Queue Length 95th (ft)  |                                                                                    |      |      | #193                                                                              |      | 20                                                                                  |      | 40                                                                                  | 0                                                                                   |      | m93                                                                                 | m0                                                                                  |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 190                                                                               |                                                                                   |                                                                                   | 385                                                                               |                                                                                   |                                                                                    | 689                                                                                 |                                                                                     |                                                                                     | 696                                                                                 |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 150                                                                               |                                                                                    |                                                                                     | 215                                                                                 |                                                                                     |                                                                                     | 200                                                                                 |
| Base Capacity (vph)     |                                                                                   |                                                                                   |                                                                                   | 289                                                                               |                                                                                   | 251                                                                               |                                                                                    | 2657                                                                                | 1583                                                                                |                                                                                     | 2657                                                                                | 1327                                                                                |
| Starvation Cap Reductn  |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                    | 0                                                                                   | 0                                                                                   |                                                                                     | 118                                                                                 | 0                                                                                   |
| Spillback Cap Reductn   |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                    | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                    | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       |                                                                                   |                                                                                   |                                                                                   | 0.66                                                                              |                                                                                   | 0.07                                                                              |                                                                                    | 0.25                                                                                | 0.32                                                                                |                                                                                     | 0.83                                                                                | 0.36                                                                                |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 2 (2%), Referenced to phase 2:SBT and 6:NBT, Start of Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.80

Intersection Signal Delay: 4.9

Intersection LOS: A

Intersection Capacity Utilization 71.4%

ICU Level of Service C

Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: North Ramp & Centennial Rd



|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |                                                                                   |  |  |  |  |                                                                                   |  |  |                                                                                     |  |  |                                                                                     |
| Volume (vph)            | 12                                                                                | 2                                                                                 | 369                                                                               | 155                                                                               | 8                                                                                 | 69                                                                                | 129                                                                                 | 551                                                                                 | 130                                                                                 | 35                                                                                  | 1871                                                                                | 31                                                                                  |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 0                                                                                 |                                                                                   | 200                                                                               | 200                                                                               |                                                                                   | 200                                                                               | 530                                                                                 |                                                                                     | 0                                                                                   | 215                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 0                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                   |                                                                                     | 0                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                  |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 709                                                                               |                                                                                   |                                                                                   | 951                                                                               |                                                                                   |                                                                                     | 776                                                                                 |                                                                                     |                                                                                     | 1318                                                                                |                                                                                     |
| Travel Time (s)         |                                                                                   | 16.1                                                                              |                                                                                   |                                                                                   | 21.6                                                                              |                                                                                   |                                                                                     | 13.2                                                                                |                                                                                     |                                                                                     | 22.5                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 0                                                                                 | 15                                                                                | 401                                                                               | 168                                                                               | 84                                                                                | 0                                                                                 | 140                                                                                 | 740                                                                                 | 0                                                                                   | 38                                                                                  | 2068                                                                                | 0                                                                                   |
| Turn Type               | Perm                                                                              |                                                                                   | Perm                                                                              | Perm                                                                              |                                                                                   |                                                                                   | pm+pt                                                                               |                                                                                     |                                                                                     | Perm                                                                                |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 | 8                                                                                 |                                                                                   |                                                                                   | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 | 4                                                                                 | 4                                                                                 | 8                                                                                 | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     | 2                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               |                                                                                   | 5.0                                                                                 | 4.0                                                                                 |                                                                                     | 4.0                                                                                 | 4.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              |                                                                                   | 9.0                                                                                 | 20.0                                                                                |                                                                                     | 20.0                                                                                | 20.0                                                                                |                                                                                     |
| Total Split (s)         | 25.0                                                                              | 25.0                                                                              | 25.0                                                                              | 25.0                                                                              | 25.0                                                                              | 0.0                                                                               | 12.0                                                                                | 75.0                                                                                | 0.0                                                                                 | 63.0                                                                                | 63.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 25.0%                                                                             | 25.0%                                                                             | 25.0%                                                                             | 25.0%                                                                             | 25.0%                                                                             | 0.0%                                                                              | 12.0%                                                                               | 75.0%                                                                               | 0.0%                                                                                | 63.0%                                                                               | 63.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               |                                                                                   | 3.5                                                                                 | 3.5                                                                                 |                                                                                     | 3.5                                                                                 | 3.5                                                                                 |                                                                                     |
| All-Red Time (s)        | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               |                                                                                   | 0.5                                                                                 | 0.5                                                                                 |                                                                                     | 0.5                                                                                 | 0.5                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lag                                                                                 |                                                                                     |                                                                                     | Lead                                                                                | Lead                                                                                |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 | Yes                                                                                 |                                                                                     |
| Recall Mode             | None                                                                              | None                                                                              | None                                                                              | None                                                                              | None                                                                              |                                                                                   | None                                                                                | C-Min                                                                               |                                                                                     | C-Min                                                                               | C-Min                                                                               |                                                                                     |
| Act Effect Green (s)    |                                                                                   | 20.2                                                                              | 20.2                                                                              | 20.2                                                                              | 20.2                                                                              |                                                                                   | 71.8                                                                                | 71.8                                                                                |                                                                                     | 60.5                                                                                | 60.5                                                                                |                                                                                     |
| Actuated g/C Ratio      |                                                                                   | 0.20                                                                              | 0.20                                                                              | 0.20                                                                              | 0.20                                                                              |                                                                                   | 0.72                                                                                | 0.72                                                                                |                                                                                     | 0.60                                                                                | 0.60                                                                                |                                                                                     |
| v/c Ratio               |                                                                                   | 0.05                                                                              | 0.93                                                                              | 0.60                                                                              | 0.22                                                                              |                                                                                   | 0.69                                                                                | 0.30                                                                                |                                                                                     | 0.10                                                                                | 0.97                                                                                |                                                                                     |
| Control Delay           |                                                                                   | 32.1                                                                              | 55.7                                                                              | 45.6                                                                              | 11.0                                                                              |                                                                                   | 40.5                                                                                | 4.6                                                                                 |                                                                                     | 4.2                                                                                 | 13.6                                                                                |                                                                                     |
| Queue Delay             |                                                                                   | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                                 | 0.0                                                                                 |                                                                                     | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |
| Total Delay             |                                                                                   | 32.1                                                                              | 55.7                                                                              | 45.6                                                                              | 11.0                                                                              |                                                                                   | 40.5                                                                                | 4.6                                                                                 |                                                                                     | 4.2                                                                                 | 13.6                                                                                |                                                                                     |
| LOS                     |                                                                                   | C                                                                                 | E                                                                                 | D                                                                                 | B                                                                                 |                                                                                   | D                                                                                   | A                                                                                   |                                                                                     | A                                                                                   | B                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 54.8                                                                              |                                                                                   |                                                                                   | 34.1                                                                              |                                                                                   |                                                                                     | 10.3                                                                                |                                                                                     |                                                                                     | 13.4                                                                                |                                                                                     |
| Approach LOS            |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | C                                                                                 |                                                                                   |                                                                                     | B                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| Queue Length 50th (ft)  |                                                                                   | 8                                                                                 | 170                                                                               | 97                                                                                | 5                                                                                 |                                                                                   | 16                                                                                  | 32                                                                                  |                                                                                     | 4                                                                                   | 487                                                                                 |                                                                                     |
| Queue Length 95th (ft)  |                                                                                   | 25                                                                                | #351                                                                              | 167                                                                               | 44                                                                                |                                                                                   | #111                                                                                | 90                                                                                  |                                                                                     | m3                                                                                  | m192                                                                                |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 629                                                                               |                                                                                   |                                                                                   | 871                                                                               |                                                                                   |                                                                                     | 696                                                                                 |                                                                                     |                                                                                     | 1238                                                                                |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   | 200                                                                               | 200                                                                               |                                                                                   |                                                                                   | 530                                                                                 |                                                                                     |                                                                                     | 215                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     |                                                                                   | 327                                                                               | 445                                                                               | 296                                                                               | 401                                                                               |                                                                                   | 216                                                                                 | 2495                                                                                |                                                                                     | 390                                                                                 | 2137                                                                                |                                                                                     |
| Starvation Cap Reductn  |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       |                                                                                   | 0.05                                                                              | 0.90                                                                              | 0.57                                                                              | 0.21                                                                              |                                                                                   | 0.65                                                                                | 0.30                                                                                |                                                                                     | 0.10                                                                                | 0.97                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 3 (3%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.97

Intersection Signal Delay: 18.8

Intersection LOS: B

Intersection Capacity Utilization 94.1%

ICU Level of Service F

Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Trenton Dr & Centennial Rd

|                                                                                        |                                                                                         |                                                                                          |
|----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
|  ø2 |  ø1 |  ø4 |
| 63 s                                                                                   | 12 s                                                                                    | 25 s                                                                                     |
|  ø6 |                                                                                         |  ø8 |
| 75 s                                                                                   |                                                                                         | 25 s                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |  |  |  |  |  |  |                                                                                     |  |  |  |
| Volume (vph)            | 31                                                                                | 42                                                                                | 271                                                                               | 1158                                                                              | 479                                                                               | 63                                                                                | 176                                                                                 | 386                                                                                 | 37                                                                                  | 40                                                                                  | 1738                                                                                | 156                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                                 |                                                                                     | 0                                                                                   | 215                                                                                 |                                                                                     | 215                                                                                 |
| Storage Lanes           | 1                                                                                 |                                                                                   | 1                                                                                 | 2                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                   |                                                                                     | 0                                                                                   | 1                                                                                   |                                                                                     | 1                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                  |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 35                                                                                |                                                                                   |                                                                                   | 35                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 805                                                                               |                                                                                   |                                                                                   | 659                                                                               |                                                                                   |                                                                                     | 1318                                                                                |                                                                                     |                                                                                     | 490                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 15.7                                                                              |                                                                                   |                                                                                   | 12.8                                                                              |                                                                                   |                                                                                     | 22.5                                                                                |                                                                                     |                                                                                     | 8.4                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 34                                                                                | 46                                                                                | 295                                                                               | 1259                                                                              | 521                                                                               | 68                                                                                | 191                                                                                 | 460                                                                                 | 0                                                                                   | 43                                                                                  | 1889                                                                                | 170                                                                                 |
| Turn Type               | pm+pt                                                                             |                                                                                   | Perm                                                                              | pm+pt                                                                             |                                                                                   | Perm                                                                              | pm+pt                                                                               |                                                                                     |                                                                                     | pm+pt                                                                               |                                                                                     | Perm                                                                                |
| Protected Phases        | 7                                                                                 | 4                                                                                 |                                                                                   | 3                                                                                 | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     | 2                                                                                   |
| Detector Phase          | 7                                                                                 | 4                                                                                 | 4                                                                                 | 3                                                                                 | 8                                                                                 | 8                                                                                 | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   | 2                                                                                   |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 4.0                                                                               | 10.0                                                                              | 10.0                                                                              | 4.0                                                                               | 10.0                                                                              | 10.0                                                                              | 4.0                                                                                 | 6.0                                                                                 |                                                                                     | 4.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 |
| Minimum Split (s)       | 8.0                                                                               | 15.7                                                                              | 15.7                                                                              | 8.0                                                                               | 15.7                                                                              | 15.7                                                                              | 8.0                                                                                 | 11.5                                                                                |                                                                                     | 8.0                                                                                 | 11.5                                                                                | 11.5                                                                                |
| Total Split (s)         | 12.0                                                                              | 17.0                                                                              | 17.0                                                                              | 24.0                                                                              | 29.0                                                                              | 29.0                                                                              | 12.0                                                                                | 47.0                                                                                | 0.0                                                                                 | 12.0                                                                                | 47.0                                                                                | 47.0                                                                                |
| Total Split (%)         | 12.0%                                                                             | 17.0%                                                                             | 17.0%                                                                             | 24.0%                                                                             | 29.0%                                                                             | 29.0%                                                                             | 12.0%                                                                               | 47.0%                                                                               | 0.0%                                                                                | 12.0%                                                                               | 47.0%                                                                               | 47.0%                                                                               |
| Yellow Time (s)         | 3.5                                                                               | 3.9                                                                               | 3.9                                                                               | 3.5                                                                               | 3.9                                                                               | 3.9                                                                               | 3.5                                                                                 | 3.6                                                                                 |                                                                                     | 3.5                                                                                 | 3.6                                                                                 | 3.6                                                                                 |
| All-Red Time (s)        | 0.5                                                                               | 1.8                                                                               | 1.8                                                                               | 0.5                                                                               | 1.8                                                                               | 1.8                                                                               | 0.5                                                                                 | 1.9                                                                                 |                                                                                     | 0.5                                                                                 | 1.9                                                                                 | 1.9                                                                                 |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 5.7                                                                               | 5.7                                                                               | 4.0                                                                               | 5.7                                                                               | 5.7                                                                               | 4.0                                                                                 | 5.5                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 5.5                                                                                 | 5.5                                                                                 |
| Lead/Lag                | Lag                                                                               | Lag                                                                               | Lag                                                                               | Lead                                                                              | Lead                                                                              | Lead                                                                              | Lead                                                                                | Lead                                                                                |                                                                                     | Lag                                                                                 | Lag                                                                                 | Lag                                                                                 |
| Lead-Lag Optimize?      | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                                 | Yes                                                                                 |                                                                                     | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 |
| Recall Mode             | None                                                                              | Max                                                                               | Max                                                                               | None                                                                              | Max                                                                               | Max                                                                               | None                                                                                | C-Max                                                                               |                                                                                     | None                                                                                | C-Max                                                                               | C-Max                                                                               |
| Act Effect Green (s)    | 13.0                                                                              | 11.3                                                                              | 11.3                                                                              | 29.8                                                                              | 28.1                                                                              | 28.1                                                                              | 47.8                                                                                | 46.3                                                                                |                                                                                     | 43.0                                                                                | 41.5                                                                                | 41.5                                                                                |
| Actuated g/C Ratio      | 0.13                                                                              | 0.11                                                                              | 0.11                                                                              | 0.30                                                                              | 0.28                                                                              | 0.28                                                                              | 0.48                                                                                | 0.46                                                                                |                                                                                     | 0.43                                                                                | 0.42                                                                                | 0.42                                                                                |
| v/c Ratio               | 0.19                                                                              | 0.12                                                                              | 0.98                                                                              | 1.46                                                                              | 0.52                                                                              | 0.14                                                                              | 0.85                                                                                | 0.28                                                                                |                                                                                     | 0.10                                                                                | 1.29                                                                                | 0.24                                                                                |
| Control Delay           | 42.9                                                                              | 40.7                                                                              | 72.3                                                                              | 242.3                                                                             | 33.9                                                                              | 8.6                                                                               | 56.7                                                                                | 16.2                                                                                |                                                                                     | 18.0                                                                                | 162.0                                                                               | 9.0                                                                                 |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 |                                                                                     | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             | 42.9                                                                              | 40.7                                                                              | 72.3                                                                              | 242.3                                                                             | 33.9                                                                              | 8.6                                                                               | 56.7                                                                                | 16.2                                                                                |                                                                                     | 18.0                                                                                | 162.0                                                                               | 9.0                                                                                 |
| LOS                     | D                                                                                 | D                                                                                 | E                                                                                 | F                                                                                 | C                                                                                 | A                                                                                 | E                                                                                   | B                                                                                   |                                                                                     | B                                                                                   | F                                                                                   | A                                                                                   |
| Approach Delay          |                                                                                   | 65.7                                                                              |                                                                                   |                                                                                   | 175.0                                                                             |                                                                                   |                                                                                     | 28.1                                                                                |                                                                                     |                                                                                     | 146.7                                                                               |                                                                                     |
| Approach LOS            |                                                                                   | E                                                                                 |                                                                                   |                                                                                   | F                                                                                 |                                                                                   |                                                                                     | C                                                                                   |                                                                                     |                                                                                     | F                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 20                                                                                | 14                                                                                | 104                                                                               | ~567                                                                              | 157                                                                               | 0                                                                                 | 84                                                                                  | 77                                                                                  |                                                                                     | 16                                                                                  | ~810                                                                                | 26                                                                                  |
| Queue Length 95th (ft)  | 49                                                                                | 31                                                                                | #276                                                                              | #696                                                                              | 214                                                                               | 34                                                                                | #204                                                                                | 135                                                                                 |                                                                                     | 36                                                                                  | #948                                                                                | 69                                                                                  |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 725                                                                               |                                                                                   |                                                                                   | 579                                                                               |                                                                                   |                                                                                     | 1238                                                                                |                                                                                     |                                                                                     | 410                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                                 |                                                                                     |                                                                                     | 215                                                                                 |                                                                                     | 215                                                                                 |
| Base Capacity (vph)     | 184                                                                               | 400                                                                               | 301                                                                               | 862                                                                               | 995                                                                               | 494                                                                               | 226                                                                                 | 1624                                                                                |                                                                                     | 459                                                                                 | 1469                                                                                | 716                                                                                 |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       | 0.18                                                                              | 0.12                                                                              | 0.98                                                                              | 1.46                                                                              | 0.52                                                                              | 0.14                                                                              | 0.85                                                                                | 0.28                                                                                |                                                                                     | 0.09                                                                                | 1.29                                                                                | 0.24                                                                                |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 72 (72%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 150

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.46

Intersection Signal Delay: 135.6

Intersection LOS: F

Intersection Capacity Utilization 110.5%

ICU Level of Service H

Analysis Period (min) 15

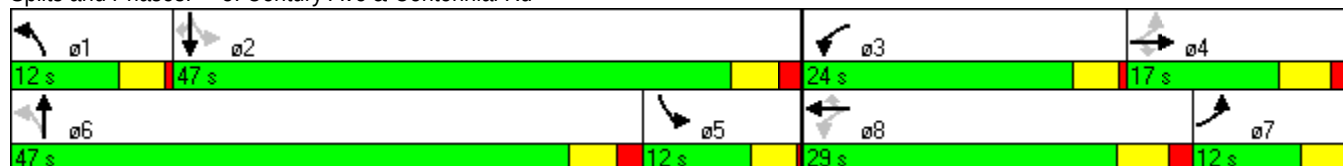
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 5: Century Ave & Centennial Rd





## **Appendix U: 2035 - Signal at Trenton & NE Loop Ramp PM (3C2)**

Exit 161 Operational Study  
Bismarck, ND

1: Divide Ave & Bismarck Expy

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |                                                                                   |  |  |  |  |  |  |  |  |  |
| Volume (vph)            | 295                                                                               | 58                                                                                | 26                                                                                | 112                                                                               | 92                                                                                | 410                                                                               | 24                                                                                  | 854                                                                                 | 60                                                                                  | 270                                                                                 | 1150                                                                                | 174                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 150                                                                               |                                                                                   | 0                                                                                 | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                 |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                   |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 100                                                                               |                                                                                   | 25                                                                                | 100                                                                               |                                                                                   | 100                                                                               | 100                                                                                 |                                                                                     | 150                                                                                 | 100                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 25                                                                                |                                                                                   |                                                                                   | 25                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 371                                                                               |                                                                                   |                                                                                   | 341                                                                               |                                                                                   |                                                                                     | 614                                                                                 |                                                                                     |                                                                                     | 458                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 10.1                                                                              |                                                                                   |                                                                                   | 9.3                                                                               |                                                                                   |                                                                                     | 10.5                                                                                |                                                                                     |                                                                                     | 7.8                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 4%                                                                                | 1%                                                                                | 1%                                                                                | 11%                                                                               | 10%                                                                               | 22%                                                                               | 10%                                                                                 | 7%                                                                                  | 17%                                                                                 | 11%                                                                                 | 4%                                                                                  | 4%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 321                                                                               | 91                                                                                | 0                                                                                 | 122                                                                               | 100                                                                               | 446                                                                               | 26                                                                                  | 928                                                                                 | 65                                                                                  | 293                                                                                 | 1439                                                                                | 0                                                                                   |
| Turn Type               | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                              |                                                                                   | pm+ov                                                                             | Perm                                                                                |                                                                                     | Perm                                                                                | pm+pt                                                                               |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 | 5                                                                                 |                                                                                     | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                   |                                                                                     | 6                                                                                   | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 | 4                                                                                 |                                                                                   | 8                                                                                 | 8                                                                                 | 5                                                                                 | 6                                                                                   | 6                                                                                   | 6                                                                                   | 5                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               | 6.0                                                                               |                                                                                   | 6.0                                                                               | 6.0                                                                               | 5.0                                                                               | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 5.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 30.0                                                                              | 30.0                                                                              |                                                                                   | 30.0                                                                              | 30.0                                                                              | 9.8                                                                               | 22.9                                                                                | 22.9                                                                                | 22.9                                                                                | 9.8                                                                                 | 28.7                                                                                |                                                                                     |
| Total Split (s)         | 37.0                                                                              | 37.0                                                                              | 0.0                                                                               | 37.0                                                                              | 37.0                                                                              | 23.0                                                                              | 40.0                                                                                | 40.0                                                                                | 40.0                                                                                | 23.0                                                                                | 63.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 37.0%                                                                             | 37.0%                                                                             | 0.0%                                                                              | 37.0%                                                                             | 37.0%                                                                             | 23.0%                                                                             | 40.0%                                                                               | 40.0%                                                                               | 40.0%                                                                               | 23.0%                                                                               | 63.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 3.0                                                                               | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 | 3.0                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 1.0                                                                               | 1.8                                                                                 | 1.8                                                                                 | 1.8                                                                                 | 1.0                                                                                 | 1.8                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 5.7                                                                                 | 5.7                                                                                 | 5.7                                                                                 | 4.0                                                                                 | 5.7                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lead                                                                              | Lag                                                                                 | Lag                                                                                 | Lag                                                                                 | Lead                                                                                |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                               | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 |                                                                                     |                                                                                     |
| Recall Mode             | None                                                                              | None                                                                              |                                                                                   | None                                                                              | None                                                                              | None                                                                              | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               | None                                                                                | C-Min                                                                               |                                                                                     |
| Act Effct Green (s)     | 28.3                                                                              | 28.3                                                                              |                                                                                   | 28.3                                                                              | 28.3                                                                              | 50.2                                                                              | 40.1                                                                                | 40.1                                                                                | 40.1                                                                                | 61.7                                                                                | 60.0                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.28                                                                              | 0.28                                                                              |                                                                                   | 0.28                                                                              | 0.28                                                                              | 0.50                                                                              | 0.40                                                                                | 0.40                                                                                | 0.40                                                                                | 0.62                                                                                | 0.60                                                                                |                                                                                     |
| v/c Ratio               | 0.90                                                                              | 0.17                                                                              |                                                                                   | 0.36                                                                              | 0.20                                                                              | 0.66                                                                              | 0.22                                                                                | 0.69                                                                                | 0.11                                                                                | 0.76                                                                                | 0.70                                                                                |                                                                                     |
| Control Delay           | 62.3                                                                              | 20.1                                                                              |                                                                                   | 31.1                                                                              | 27.3                                                                              | 21.5                                                                              | 29.8                                                                                | 29.6                                                                                | 6.4                                                                                 | 31.1                                                                                | 11.5                                                                                |                                                                                     |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.1                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.5                                                                                 |                                                                                     |
| Total Delay             | 62.3                                                                              | 20.1                                                                              |                                                                                   | 31.1                                                                              | 27.3                                                                              | 21.5                                                                              | 29.8                                                                                | 29.7                                                                                | 6.4                                                                                 | 31.1                                                                                | 12.0                                                                                |                                                                                     |
| LOS                     | E                                                                                 | C                                                                                 |                                                                                   | C                                                                                 | C                                                                                 | C                                                                                 | C                                                                                   | C                                                                                   | A                                                                                   | C                                                                                   | B                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 53.0                                                                              |                                                                                   |                                                                                   | 24.1                                                                              |                                                                                   |                                                                                     | 28.2                                                                                |                                                                                     |                                                                                     | 15.2                                                                                |                                                                                     |
| Approach LOS            |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | C                                                                                 |                                                                                   |                                                                                     | C                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 188                                                                               | 31                                                                                |                                                                                   | 59                                                                                | 46                                                                                | 167                                                                               | 12                                                                                  | 277                                                                                 | 0                                                                                   | 103                                                                                 | 263                                                                                 |                                                                                     |
| Queue Length 95th (ft)  | #336                                                                              | 69                                                                                |                                                                                   | 110                                                                               | 87                                                                                | 264                                                                               | 37                                                                                  | 358                                                                                 | 29                                                                                  | 189                                                                                 | 306                                                                                 |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 291                                                                               |                                                                                   |                                                                                   | 261                                                                               |                                                                                   |                                                                                    | 534                                                                                 |                                                                                     |                                                                                     | 378                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 150                                                                               |                                                                                   |                                                                                   | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 392                                                                               | 572                                                                               |                                                                                   | 370                                                                               | 535                                                                               | 719                                                                               | 117                                                                                | 1353                                                                                | 592                                                                                 | 429                                                                                 | 2052                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 226                                                                                 |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 32                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.82                                                                              | 0.16                                                                              |                                                                                   | 0.33                                                                              | 0.19                                                                              | 0.62                                                                              | 0.22                                                                               | 0.70                                                                                | 0.11                                                                                | 0.68                                                                                | 0.79                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 12 (12%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.90

Intersection Signal Delay: 24.3

Intersection LOS: C

Intersection Capacity Utilization 79.8%

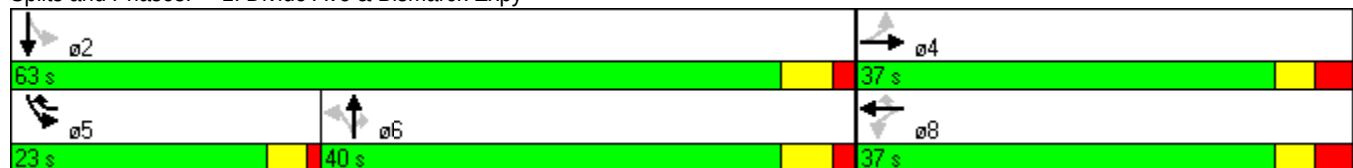
ICU Level of Service D

Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 1: Divide Ave & Bismarck Expy



|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |                                                                                   |  |                                                                                   |                                                                                   |                                                                                   |                                                                                    |  |  |  |  |                                                                                     |
| Volume (vph)            | 394                                                                               | 0                                                                                 | 529                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 1584                                                                                | 155                                                                                 | 35                                                                                  | 724                                                                                 | 0                                                                                   |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                 | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 200                                                                               |                                                                                   | 200                                                                               | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  |                                                                                     | 0                                                                                   | 222                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 2                                                                                 |                                                                                   | 2                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 300                                                                               | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                 |                                                                                     | 25                                                                                  | 150                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                    |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                    | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 575                                                                               |                                                                                   |                                                                                   | 383                                                                               |                                                                                   |                                                                                    | 458                                                                                 |                                                                                     |                                                                                     | 769                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 13.1                                                                              |                                                                                   |                                                                                   | 8.7                                                                               |                                                                                   |                                                                                    | 7.8                                                                                 |                                                                                     |                                                                                     | 13.1                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                               | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                               | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 3%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                 | 8%                                                                                  | 27%                                                                                 | 10%                                                                                 | 9%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 428                                                                               | 0                                                                                 | 575                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 1722                                                                                | 168                                                                                 | 38                                                                                  | 787                                                                                 | 0                                                                                   |
| Turn Type               | custom                                                                            |                                                                                   | custom                                                                            |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     | Perm                                                                                | Perm                                                                                |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     | 6                                                                                   | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                   | 6                                                                                   | 2                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               |                                                                                   | 6.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 21.1                                                                              |                                                                                   | 21.1                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 23.4                                                                                | 23.4                                                                                | 21.4                                                                                | 21.4                                                                                |                                                                                     |
| Total Split (s)         | 26.0                                                                              | 0.0                                                                               | 26.0                                                                              | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 74.0                                                                                | 74.0                                                                                | 74.0                                                                                | 74.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 26.0%                                                                             | 0.0%                                                                              | 26.0%                                                                             | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                               | 74.0%                                                                               | 74.0%                                                                               | 74.0%                                                                               | 74.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.6                                                                               |                                                                                   | 3.6                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 1.5                                                                               |                                                                                   | 1.5                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 1.5                                                                                 | 1.5                                                                                 | 1.5                                                                                 | 1.5                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 5.1                                                                               | 4.0                                                                               | 5.1                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                                | 5.4                                                                                 | 5.4                                                                                 | 5.4                                                                                 | 5.4                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Recall Mode             | None                                                                              |                                                                                   | None                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               |                                                                                     |
| Act Effct Green (s)     | 18.2                                                                              |                                                                                   | 18.2                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 71.3                                                                                | 71.3                                                                                | 71.3                                                                                | 71.3                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.18                                                                              |                                                                                   | 0.18                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.71                                                                                | 0.71                                                                                | 0.71                                                                                | 0.71                                                                                |                                                                                     |
| v/c Ratio               | 0.69                                                                              |                                                                                   | 0.67                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.72                                                                                | 0.18                                                                                | 0.34                                                                                | 0.33                                                                                |                                                                                     |
| Control Delay           | 44.1                                                                              |                                                                                   | 13.5                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 7.0                                                                                 | 0.8                                                                                 | 13.7                                                                                | 3.5                                                                                 |                                                                                     |
| Queue Delay             | 0.0                                                                               |                                                                                   | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 1.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |
| Total Delay             | 44.1                                                                              |                                                                                   | 13.5                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 8.0                                                                                 | 0.8                                                                                 | 13.7                                                                                | 3.5                                                                                 |                                                                                     |
| LOS                     | D                                                                                 |                                                                                   | B                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | A                                                                                   | A                                                                                   | B                                                                                   | A                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 7.3                                                                                 |                                                                                     |                                                                                     | 4.0                                                                                 |                                                                                     |
| Approach LOS            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | A                                                                                   |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 130                                                                               |                                                                                   | 44                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 94                                                                                  | 1                                                                                   | 4                                                                                   | 45                                                                                  |                                                                                     |
| Queue Length 95th (ft)  | 178                                                                               |                                                                                   | 103                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 162                                                                                 | m5                                                                                  | 43                                                                                  | 68                                                                                  |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 495                                                                               |                                                                                   |                                                                                   | 303                                                                               |                                                                                   |                                                                                    | 378                                                                                 |                                                                                     |                                                                                     | 689                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 200                                                                               |                                                                                   | 200                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | 222                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 711                                                                               |                                                                                   | 923                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 2382                                                                                | 955                                                                                 | 113                                                                                 | 2360                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 372                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.60                                                                              |                                                                                   | 0.62                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.86                                                                                | 0.18                                                                                | 0.34                                                                                | 0.33                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 11 (11%), Referenced to phase 2:SBTL and 6:NBT, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.72

Intersection Signal Delay: 11.8

Intersection LOS: B

Intersection Capacity Utilization 62.9%

ICU Level of Service B

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: South Ramp & Centennial Rd

|                                                                                        |                                                                                         |
|----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
|  ø2  |  ø4 |
| 74 s                                                                                   | 26 s                                                                                    |
|  ø6 |                                                                                         |
| 74 s                                                                                   |                                                                                         |

|                         |  |      |      |                                                                                   |      |                                                                                     |      |                                                                                     |                                                                                     |      |                                                                                     |                                                                                     |
|-------------------------|------------------------------------------------------------------------------------|------|------|-----------------------------------------------------------------------------------|------|-------------------------------------------------------------------------------------|------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                                | EBT  | EBR  | WBL                                                                               | WBT  | WBR                                                                                 | NBL  | NBT                                                                                 | NBR                                                                                 | SBL  | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |                                                                                    |      |      |  |      |  |      |  |  |      |  |  |
| Volume (vph)            | 0                                                                                  | 0    | 0    | 92                                                                                | 0    | 19                                                                                  | 0    | 1502                                                                                | 528                                                                                 | 0    | 767                                                                                 | 213                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                               | 1900 | 1900 | 1900                                                                              | 1900 | 1900                                                                                | 1900 | 1900                                                                                | 1900                                                                                | 1900 | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                 | 12   | 12   | 16                                                                                | 12   | 12                                                                                  | 12   | 12                                                                                  | 12                                                                                  | 12   | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                    | 0%   |      |                                                                                   | 0%   |                                                                                     |      | 0%                                                                                  |                                                                                     |      | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 0                                                                                  |      | 0    | 0                                                                                 |      | 150                                                                                 | 0    |                                                                                     | 215                                                                                 | 0    |                                                                                     | 200                                                                                 |
| Storage Lanes           | 0                                                                                  |      | 0    | 1                                                                                 |      | 1                                                                                   | 0    |                                                                                     | 1                                                                                   | 0    |                                                                                     | 1                                                                                   |
| Taper Length (ft)       | 25                                                                                 |      | 25   | 25                                                                                |      | 100                                                                                 | 150  |                                                                                     | 25                                                                                  | 25   |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                    |      | Yes  |                                                                                   |      | Yes                                                                                 |      |                                                                                     | Yes                                                                                 |      |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                    | 30   |      |                                                                                   | 30   |                                                                                     |      | 40                                                                                  |                                                                                     |      | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                    | 270  |      |                                                                                   | 465  |                                                                                     |      | 769                                                                                 |                                                                                     |      | 793                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                    | 6.1  |      |                                                                                   | 10.6 |                                                                                     |      | 13.1                                                                                |                                                                                     |      | 13.5                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                    |      |      |                                                                                   |      |                                                                                     |      |                                                                                     |                                                                                     |      |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                    |      |      |                                                                                   |      |                                                                                     |      |                                                                                     |                                                                                     |      |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                               | 0.92 | 0.92 | 0.92                                                                              | 0.92 | 0.92                                                                                | 0.92 | 0.92                                                                                | 0.92                                                                                | 0.92 | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                               | 100% | 100% | 100%                                                                              | 100% | 100%                                                                                | 100% | 100%                                                                                | 100%                                                                                | 100% | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                 | 2%   | 2%   | 12%                                                                               | 2%   | 8%                                                                                  | 6%   | 3%                                                                                  | 2%                                                                                  | 2%   | 3%                                                                                  | 1%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                  | 0    | 0    | 0                                                                                 | 0    | 0                                                                                   | 0    | 0                                                                                   | 0                                                                                   | 0    | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                    |      |      |                                                                                   |      |                                                                                     |      |                                                                                     |                                                                                     |      |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                    | 0%   |      |                                                                                   | 0%   |                                                                                     |      | 0%                                                                                  |                                                                                     |      | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                    |      |      |                                                                                   |      |                                                                                     |      |                                                                                     |                                                                                     |      |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 0                                                                                  | 0    | 0    | 100                                                                               | 0    | 21                                                                                  | 0    | 1633                                                                                | 574                                                                                 | 0    | 834                                                                                 | 232                                                                                 |
| Turn Type               |                                                                                    |      |      | custom                                                                            |      | custom                                                                              |      |                                                                                     | Free                                                                                |      |                                                                                     | Perm                                                                                |
| Protected Phases        |                                                                                    |      |      |                                                                                   |      |                                                                                     |      | 6                                                                                   |                                                                                     |      | 2                                                                                   |                                                                                     |
| Permitted Phases        |                                                                                    |      |      | 8                                                                                 |      | 8                                                                                   |      |                                                                                     | Free                                                                                |      |                                                                                     | 2                                                                                   |
| Detector Phase          |                                                                                    |      |      | 8                                                                                 |      | 8                                                                                   |      | 6                                                                                   |                                                                                     |      | 2                                                                                   | 2                                                                                   |
| Switch Phase            |                                                                                    |      |      |                                                                                   |      |                                                                                     |      |                                                                                     |                                                                                     |      |                                                                                     |                                                                                     |
| Minimum Initial (s)     |                                                                                    |      |      | 5.0                                                                               |      | 5.0                                                                                 |      | 10.0                                                                                |                                                                                     |      | 10.0                                                                                | 10.0                                                                                |
| Minimum Split (s)       |                                                                                    |      |      | 20.0                                                                              |      | 20.0                                                                                |      | 20.0                                                                                |                                                                                     |      | 22.4                                                                                | 22.4                                                                                |
| Total Split (s)         | 0.0                                                                                | 0.0  | 0.0  | 22.0                                                                              | 0.0  | 22.0                                                                                | 0.0  | 78.0                                                                                | 0.0                                                                                 | 0.0  | 78.0                                                                                | 78.0                                                                                |
| Total Split (%)         | 0.0%                                                                               | 0.0% | 0.0% | 22.0%                                                                             | 0.0% | 22.0%                                                                               | 0.0% | 78.0%                                                                               | 0.0%                                                                                | 0.0% | 78.0%                                                                               | 78.0%                                                                               |
| Yellow Time (s)         |                                                                                    |      |      | 3.2                                                                               |      | 3.2                                                                                 |      | 3.9                                                                                 |                                                                                     |      | 3.9                                                                                 | 3.9                                                                                 |
| All-Red Time (s)        |                                                                                    |      |      | 2.0                                                                               |      | 2.0                                                                                 |      | 1.5                                                                                 |                                                                                     |      | 1.5                                                                                 | 1.5                                                                                 |
| Lost Time Adjust (s)    | 0.0                                                                                | 0.0  | 0.0  | 0.0                                                                               | 0.0  | 0.0                                                                                 | 0.0  | 0.0                                                                                 | 0.0                                                                                 | 0.0  | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                                | 4.0  | 4.0  | 5.2                                                                               | 4.0  | 5.2                                                                                 | 4.0  | 5.4                                                                                 | 4.0                                                                                 | 4.0  | 5.4                                                                                 | 5.4                                                                                 |
| Lead/Lag                |                                                                                    |      |      |                                                                                   |      |                                                                                     |      |                                                                                     |                                                                                     |      |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                    |      |      |                                                                                   |      |                                                                                     |      |                                                                                     |                                                                                     |      |                                                                                     |                                                                                     |
| Recall Mode             |                                                                                    |      |      | None                                                                              |      | None                                                                                |      | C-Min                                                                               |                                                                                     |      | C-Min                                                                               | C-Min                                                                               |
| Act Effect Green (s)    |                                                                                    |      |      | 9.8                                                                               |      | 9.8                                                                                 |      | 82.8                                                                                | 100.0                                                                               |      | 82.8                                                                                | 82.8                                                                                |
| Actuated g/C Ratio      |                                                                                    |      |      | 0.10                                                                              |      | 0.10                                                                                |      | 0.83                                                                                | 1.00                                                                                |      | 0.83                                                                                | 0.83                                                                                |
| v/c Ratio               |                                                                                    |      |      | 0.56                                                                              |      | 0.13                                                                                |      | 0.56                                                                                | 0.36                                                                                |      | 0.29                                                                                | 0.17                                                                                |
| Control Delay           |                                                                                    |      |      | 54.1                                                                              |      | 17.3                                                                                |      | 4.1                                                                                 | 0.5                                                                                 |      | 3.5                                                                                 | 1.5                                                                                 |
| Queue Delay             |                                                                                    |      |      | 0.0                                                                               |      | 0.0                                                                                 |      | 0.1                                                                                 | 0.0                                                                                 |      | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             |                                                                                    |      |      | 54.1                                                                              |      | 17.3                                                                                |      | 4.2                                                                                 | 0.5                                                                                 |      | 3.5                                                                                 | 1.5                                                                                 |
| LOS                     |                                                                                    |      |      | D                                                                                 |      | B                                                                                   |      | A                                                                                   | A                                                                                   |      | A                                                                                   | A                                                                                   |
| Approach Delay          |                                                                                    |      |      |                                                                                   |      |                                                                                     |      | 3.2                                                                                 |                                                                                     |      | 3.0                                                                                 |                                                                                     |
| Approach LOS            |                                                                                    |      |      |                                                                                   |      |                                                                                     |      | A                                                                                   |                                                                                     |      | A                                                                                   |                                                                                     |
| Queue Length 50th (ft)  |                                                                                    |      |      | 62                                                                                |      | 0                                                                                   |      | 192                                                                                 | 0                                                                                   |      | 94                                                                                  | 12                                                                                  |
| Queue Length 95th (ft)  |                                                                                    |      |      | 110                                                                               |      | 22                                                                                  |      | 204                                                                                 | 0                                                                                   |      | m118                                                                                | m28                                                                                 |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 190                                                                               |                                                                                   |                                                                                   | 385                                                                               |                                                                                   |                                                                                    | 689                                                                                 |                                                                                     |                                                                                     | 713                                                                                 |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 150                                                                               |                                                                                    |                                                                                     | 215                                                                                 |                                                                                     |                                                                                     | 200                                                                                 |
| Base Capacity (vph)     |                                                                                   |                                                                                   |                                                                                   | 307                                                                               |                                                                                   | 269                                                                               |                                                                                    | 2903                                                                                | 1583                                                                                |                                                                                     | 2903                                                                                | 1364                                                                                |
| Starvation Cap Reductn  |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                    | 223                                                                                 | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                    | 238                                                                                 | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                    | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       |                                                                                   |                                                                                   |                                                                                   | 0.33                                                                              |                                                                                   | 0.08                                                                              |                                                                                    | 0.61                                                                                | 0.36                                                                                |                                                                                     | 0.29                                                                                | 0.17                                                                                |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 6 (6%), Referenced to phase 2:SBT and 6:NBT, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.56

Intersection Signal Delay: 4.8

Intersection LOS: A

Intersection Capacity Utilization 54.5%

ICU Level of Service A

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: North Ramp & Centennial Rd



|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |                                                                                   |  |  |  |  |                                                                                   |  |  |                                                                                     |  |  |                                                                                     |
| Volume (vph)            | 24                                                                                | 4                                                                                 | 149                                                                               | 206                                                                               | 2                                                                                 | 131                                                                               | 235                                                                                 | 1866                                                                                | 338                                                                                 | 80                                                                                  | 853                                                                                 | 24                                                                                  |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 0                                                                                 |                                                                                   | 200                                                                               | 200                                                                               |                                                                                   | 200                                                                               | 530                                                                                 |                                                                                     | 0                                                                                   | 215                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 0                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                   |                                                                                     | 0                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                  |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 681                                                                               |                                                                                   |                                                                                   | 921                                                                               |                                                                                   |                                                                                     | 793                                                                                 |                                                                                     |                                                                                     | 1295                                                                                |                                                                                     |
| Travel Time (s)         |                                                                                   | 15.5                                                                              |                                                                                   |                                                                                   | 20.9                                                                              |                                                                                   |                                                                                     | 13.5                                                                                |                                                                                     |                                                                                     | 22.1                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 0                                                                                 | 30                                                                                | 162                                                                               | 224                                                                               | 144                                                                               | 0                                                                                 | 255                                                                                 | 2395                                                                                | 0                                                                                   | 87                                                                                  | 953                                                                                 | 0                                                                                   |
| Turn Type               | Perm                                                                              |                                                                                   | Perm                                                                              | Perm                                                                              |                                                                                   |                                                                                   | pm+pt                                                                               |                                                                                     |                                                                                     | pm+pt                                                                               |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 | 8                                                                                 |                                                                                   |                                                                                   | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 | 4                                                                                 | 4                                                                                 | 8                                                                                 | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               |                                                                                   | 5.0                                                                                 | 4.0                                                                                 |                                                                                     | 5.0                                                                                 | 4.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              |                                                                                   | 9.0                                                                                 | 20.0                                                                                |                                                                                     | 9.0                                                                                 | 20.0                                                                                |                                                                                     |
| Total Split (s)         | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 0.0                                                                               | 20.0                                                                                | 68.0                                                                                | 0.0                                                                                 | 12.0                                                                                | 60.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 20.0%                                                                             | 20.0%                                                                             | 20.0%                                                                             | 20.0%                                                                             | 20.0%                                                                             | 0.0%                                                                              | 20.0%                                                                               | 68.0%                                                                               | 0.0%                                                                                | 12.0%                                                                               | 60.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               |                                                                                   | 3.5                                                                                 | 3.5                                                                                 |                                                                                     | 3.5                                                                                 | 3.5                                                                                 |                                                                                     |
| All-Red Time (s)        | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               |                                                                                   | 0.5                                                                                 | 0.5                                                                                 |                                                                                     | 0.5                                                                                 | 0.5                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lead                                                                                | Lead                                                                                |                                                                                     | Lag                                                                                 | Lag                                                                                 |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                                 | Yes                                                                                 |                                                                                     | Yes                                                                                 | Yes                                                                                 |                                                                                     |
| Recall Mode             | None                                                                              | None                                                                              | None                                                                              | None                                                                              | None                                                                              |                                                                                   | None                                                                                | C-Min                                                                               |                                                                                     | None                                                                                | C-Min                                                                               |                                                                                     |
| Act Effect Green (s)    |                                                                                   | 17.6                                                                              | 17.6                                                                              | 17.6                                                                              | 17.6                                                                              |                                                                                   | 65.1                                                                                | 65.1                                                                                |                                                                                     | 59.9                                                                                | 58.8                                                                                |                                                                                     |
| Actuated g/C Ratio      |                                                                                   | 0.18                                                                              | 0.18                                                                              | 0.18                                                                              | 0.18                                                                              |                                                                                   | 0.65                                                                                | 0.65                                                                                |                                                                                     | 0.60                                                                                | 0.59                                                                                |                                                                                     |
| v/c Ratio               |                                                                                   | 0.12                                                                              | 0.39                                                                              | 0.93                                                                              | 0.36                                                                              |                                                                                   | 0.62                                                                                | 1.06                                                                                |                                                                                     | 0.43                                                                                | 0.46                                                                                |                                                                                     |
| Control Delay           |                                                                                   | 37.6                                                                              | 9.2                                                                               | 85.2                                                                              | 9.8                                                                               |                                                                                   | 12.5                                                                                | 52.0                                                                                |                                                                                     | 20.7                                                                                | 7.3                                                                                 |                                                                                     |
| Queue Delay             |                                                                                   | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                                 | 0.0                                                                                 |                                                                                     | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |
| Total Delay             |                                                                                   | 37.6                                                                              | 9.2                                                                               | 85.2                                                                              | 9.8                                                                               |                                                                                   | 12.5                                                                                | 52.0                                                                                |                                                                                     | 20.7                                                                                | 7.3                                                                                 |                                                                                     |
| LOS                     |                                                                                   | D                                                                                 | A                                                                                 | F                                                                                 | A                                                                                 |                                                                                   | B                                                                                   | D                                                                                   |                                                                                     | C                                                                                   | A                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 13.6                                                                              |                                                                                   |                                                                                   | 55.7                                                                              |                                                                                   |                                                                                     | 48.2                                                                                |                                                                                     |                                                                                     | 8.4                                                                                 |                                                                                     |
| Approach LOS            |                                                                                   | B                                                                                 |                                                                                   |                                                                                   | E                                                                                 |                                                                                   |                                                                                     | D                                                                                   |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |
| Queue Length 50th (ft)  |                                                                                   | 17                                                                                | 0                                                                                 | ~148                                                                              | 2                                                                                 |                                                                                   | 31                                                                                  | ~906                                                                                |                                                                                     | 14                                                                                  | 83                                                                                  |                                                                                     |
| Queue Length 95th (ft)  |                                                                                   | 44                                                                                | 56                                                                                | #300                                                                              | 55                                                                                |                                                                                   | 69                                                                                  | #1029                                                                               |                                                                                     | 35                                                                                  | 88                                                                                  |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 601                                                                               |                                                                                   |                                                                                   | 841                                                                               |                                                                                   |                                                                                    | 713                                                                                 |                                                                                     |                                                                                     | 1215                                                                                |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   | 200                                                                               | 200                                                                               |                                                                                   |                                                                                   | 530                                                                                |                                                                                     |                                                                                     | 215                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     |                                                                                   | 245                                                                               | 411                                                                               | 242                                                                               | 395                                                                               |                                                                                   | 474                                                                                | 2265                                                                                |                                                                                     | 216                                                                                 | 2074                                                                                |                                                                                     |
| Starvation Cap Reductn  |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       |                                                                                   | 0.12                                                                              | 0.39                                                                              | 0.93                                                                              | 0.36                                                                              |                                                                                   | 0.54                                                                               | 1.06                                                                                |                                                                                     | 0.40                                                                                | 0.46                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 36 (36%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 110

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.06

Intersection Signal Delay: 37.5

Intersection LOS: D

Intersection Capacity Utilization 94.9%

ICU Level of Service F

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 4: Trenton Dr & Centennial Rd



|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |  |  |  |  |  |  |                                                                                     |  |  |  |
| Volume (vph)            | 98                                                                                | 300                                                                               | 253                                                                               | 238                                                                               | 191                                                                               | 47                                                                                | 243                                                                                 | 771                                                                                 | 331                                                                                 | 70                                                                                  | 483                                                                                 | 60                                                                                  |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                                 |                                                                                     | 0                                                                                   | 215                                                                                 |                                                                                     | 215                                                                                 |
| Storage Lanes           | 1                                                                                 |                                                                                   | 1                                                                                 | 2                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                   |                                                                                     | 0                                                                                   | 1                                                                                   |                                                                                     | 1                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                  |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 35                                                                                |                                                                                   |                                                                                   | 35                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 682                                                                               |                                                                                   |                                                                                   | 662                                                                               |                                                                                   |                                                                                     | 1295                                                                                |                                                                                     |                                                                                     | 520                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 13.3                                                                              |                                                                                   |                                                                                   | 12.9                                                                              |                                                                                   |                                                                                     | 22.1                                                                                |                                                                                     |                                                                                     | 8.9                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 107                                                                               | 326                                                                               | 275                                                                               | 259                                                                               | 208                                                                               | 51                                                                                | 264                                                                                 | 1198                                                                                | 0                                                                                   | 76                                                                                  | 525                                                                                 | 65                                                                                  |
| Turn Type               | pm+pt                                                                             |                                                                                   | Perm                                                                              | pm+pt                                                                             |                                                                                   | Perm                                                                              | pm+pt                                                                               |                                                                                     |                                                                                     | pm+pt                                                                               |                                                                                     | Perm                                                                                |
| Protected Phases        | 7                                                                                 | 4                                                                                 |                                                                                   | 3                                                                                 | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     | 2                                                                                   |
| Detector Phase          | 7                                                                                 | 4                                                                                 | 4                                                                                 | 3                                                                                 | 8                                                                                 | 8                                                                                 | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   | 2                                                                                   |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 4.0                                                                               | 10.0                                                                              | 10.0                                                                              | 4.0                                                                               | 10.0                                                                              | 10.0                                                                              | 4.0                                                                                 | 6.0                                                                                 |                                                                                     | 4.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 |
| Minimum Split (s)       | 8.0                                                                               | 15.7                                                                              | 15.7                                                                              | 8.0                                                                               | 15.7                                                                              | 15.7                                                                              | 8.0                                                                                 | 11.5                                                                                |                                                                                     | 8.0                                                                                 | 11.5                                                                                | 11.5                                                                                |
| Total Split (s)         | 12.0                                                                              | 24.0                                                                              | 24.0                                                                              | 12.0                                                                              | 24.0                                                                              | 24.0                                                                              | 17.0                                                                                | 52.0                                                                                | 0.0                                                                                 | 12.0                                                                                | 47.0                                                                                | 47.0                                                                                |
| Total Split (%)         | 12.0%                                                                             | 24.0%                                                                             | 24.0%                                                                             | 12.0%                                                                             | 24.0%                                                                             | 24.0%                                                                             | 17.0%                                                                               | 52.0%                                                                               | 0.0%                                                                                | 12.0%                                                                               | 47.0%                                                                               | 47.0%                                                                               |
| Yellow Time (s)         | 3.5                                                                               | 3.9                                                                               | 3.9                                                                               | 3.5                                                                               | 3.9                                                                               | 3.9                                                                               | 3.5                                                                                 | 3.6                                                                                 |                                                                                     | 3.5                                                                                 | 3.6                                                                                 | 3.6                                                                                 |
| All-Red Time (s)        | 0.5                                                                               | 1.8                                                                               | 1.8                                                                               | 0.5                                                                               | 1.8                                                                               | 1.8                                                                               | 0.5                                                                                 | 1.9                                                                                 |                                                                                     | 0.5                                                                                 | 1.9                                                                                 | 1.9                                                                                 |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 5.7                                                                               | 5.7                                                                               | 4.0                                                                               | 5.7                                                                               | 5.7                                                                               | 4.0                                                                                 | 5.5                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 5.5                                                                                 | 5.5                                                                                 |
| Lead/Lag                | Lag                                                                               | Lead                                                                              | Lead                                                                              | Lag                                                                               | Lead                                                                              | Lead                                                                              | Lag                                                                                 | Lead                                                                                |                                                                                     | Lag                                                                                 | Lead                                                                                | Lead                                                                                |
| Lead-Lag Optimize?      | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                                 | Yes                                                                                 |                                                                                     | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 |
| Recall Mode             | None                                                                              | Max                                                                               | Max                                                                               | None                                                                              | Max                                                                               | Max                                                                               | None                                                                                | C-Max                                                                               |                                                                                     | None                                                                                | C-Max                                                                               | C-Max                                                                               |
| Act Effect Green (s)    | 25.9                                                                              | 18.3                                                                              | 18.3                                                                              | 25.9                                                                              | 18.3                                                                              | 18.3                                                                              | 62.1                                                                                | 52.2                                                                                |                                                                                     | 54.1                                                                                | 46.3                                                                                | 46.3                                                                                |
| Actuated g/C Ratio      | 0.26                                                                              | 0.18                                                                              | 0.18                                                                              | 0.26                                                                              | 0.18                                                                              | 0.18                                                                              | 0.62                                                                                | 0.52                                                                                |                                                                                     | 0.54                                                                                | 0.46                                                                                | 0.46                                                                                |
| v/c Ratio               | 0.32                                                                              | 0.50                                                                              | 0.54                                                                              | 0.48                                                                              | 0.32                                                                              | 0.15                                                                              | 0.45                                                                                | 0.66                                                                                |                                                                                     | 0.34                                                                                | 0.32                                                                                | 0.08                                                                                |
| Control Delay           | 30.3                                                                              | 39.9                                                                              | 8.7                                                                               | 32.7                                                                              | 37.1                                                                              | 11.2                                                                              | 6.7                                                                                 | 4.6                                                                                 |                                                                                     | 18.4                                                                                | 18.1                                                                                | 4.6                                                                                 |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 |                                                                                     | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             | 30.3                                                                              | 39.9                                                                              | 8.7                                                                               | 32.7                                                                              | 37.1                                                                              | 11.2                                                                              | 6.7                                                                                 | 4.6                                                                                 |                                                                                     | 18.4                                                                                | 18.1                                                                                | 4.6                                                                                 |
| LOS                     | C                                                                                 | D                                                                                 | A                                                                                 | C                                                                                 | D                                                                                 | B                                                                                 | A                                                                                   | A                                                                                   |                                                                                     | B                                                                                   | B                                                                                   | A                                                                                   |
| Approach Delay          |                                                                                   | 26.3                                                                              |                                                                                   |                                                                                   | 32.3                                                                              |                                                                                   |                                                                                     | 5.0                                                                                 |                                                                                     |                                                                                     | 16.8                                                                                |                                                                                     |
| Approach LOS            |                                                                                   | C                                                                                 |                                                                                   |                                                                                   | C                                                                                 |                                                                                   |                                                                                     | A                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 51                                                                                | 99                                                                                | 0                                                                                 | 64                                                                                | 61                                                                                | 0                                                                                 | 34                                                                                  | 111                                                                                 |                                                                                     | 18                                                                                  | 108                                                                                 | 0                                                                                   |
| Queue Length 95th (ft)  | 93                                                                                | 144                                                                               | 69                                                                                | 95                                                                                | 95                                                                                | 32                                                                                | m47                                                                                 | m147                                                                                |                                                                                     | 36                                                                                  | 155                                                                                 | 24                                                                                  |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 602                                                                               |                                                                                   |                                                                                   | 582                                                                               |                                                                                   |                                                                                    | 1215                                                                                |                                                                                     |                                                                                     | 440                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                                |                                                                                     |                                                                                     | 215                                                                                 |                                                                                     | 215                                                                                 |
| Base Capacity (vph)     | 373                                                                               | 648                                                                               | 514                                                                               | 612                                                                               | 648                                                                               | 331                                                                               | 634                                                                                | 1807                                                                                |                                                                                     | 256                                                                                 | 1639                                                                                | 768                                                                                 |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       | 0.29                                                                              | 0.50                                                                              | 0.54                                                                              | 0.42                                                                              | 0.32                                                                              | 0.15                                                                              | 0.42                                                                               | 0.66                                                                                |                                                                                     | 0.30                                                                                | 0.32                                                                                | 0.08                                                                                |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 56 (56%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.66

Intersection Signal Delay: 16.1

Intersection LOS: B

Intersection Capacity Utilization 66.9%

ICU Level of Service C

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: Century Ave & Centennial Rd

|                                                                                        |                                                                                        |                                                                                          |                                                                                          |
|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
|  ø2  |  ø1  |  ø4  |  ø3  |
| 47 s                                                                                   | 17 s                                                                                   | 24 s                                                                                     | 12 s                                                                                     |
|  ø6 |  ø5 |  ø8 |  ø7 |
| 52 s                                                                                   | 12 s                                                                                   | 24 s                                                                                     | 12 s                                                                                     |



**Appendix V: 2035 - Signal at Trenton & NE/SW Loop Ramps AM (3D1)**

Exit 161 Operational Study  
Bismarck, ND

1: Divide Ave & Bismarck Expy

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |                                                                                   |  |  |  |  |  |  |  |  |  |
| Volume (vph)            | 116                                                                               | 125                                                                               | 18                                                                                | 141                                                                               | 96                                                                                | 328                                                                               | 25                                                                                  | 430                                                                                 | 72                                                                                  | 428                                                                                 | 1468                                                                                | 328                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 150                                                                               |                                                                                   | 0                                                                                 | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                 |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                   |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 100                                                                               |                                                                                   | 25                                                                                | 100                                                                               |                                                                                   | 100                                                                               | 100                                                                                 |                                                                                     | 150                                                                                 | 100                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 25                                                                                |                                                                                   |                                                                                   | 25                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 371                                                                               |                                                                                   |                                                                                   | 341                                                                               |                                                                                   |                                                                                     | 614                                                                                 |                                                                                     |                                                                                     | 458                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 10.1                                                                              |                                                                                   |                                                                                   | 9.3                                                                               |                                                                                   |                                                                                     | 10.5                                                                                |                                                                                     |                                                                                     | 7.8                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 4%                                                                                | 1%                                                                                | 1%                                                                                | 11%                                                                               | 10%                                                                               | 22%                                                                               | 10%                                                                                 | 7%                                                                                  | 17%                                                                                 | 11%                                                                                 | 4%                                                                                  | 4%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 126                                                                               | 156                                                                               | 0                                                                                 | 153                                                                               | 104                                                                               | 357                                                                               | 27                                                                                  | 467                                                                                 | 78                                                                                  | 465                                                                                 | 1953                                                                                | 0                                                                                   |
| Turn Type               | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                              |                                                                                   | pm+ov                                                                             | Perm                                                                                |                                                                                     | Perm                                                                                | pm+pt                                                                               |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 | 5                                                                                 |                                                                                     | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                   |                                                                                     | 6                                                                                   | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 | 4                                                                                 |                                                                                   | 8                                                                                 | 8                                                                                 | 5                                                                                 | 6                                                                                   | 6                                                                                   | 6                                                                                   | 5                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               | 6.0                                                                               |                                                                                   | 6.0                                                                               | 6.0                                                                               | 5.0                                                                               | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 5.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 30.0                                                                              | 30.0                                                                              |                                                                                   | 30.0                                                                              | 30.0                                                                              | 9.8                                                                               | 22.9                                                                                | 22.9                                                                                | 22.9                                                                                | 9.8                                                                                 | 28.7                                                                                |                                                                                     |
| Total Split (s)         | 30.0                                                                              | 30.0                                                                              | 0.0                                                                               | 30.0                                                                              | 30.0                                                                              | 24.1                                                                              | 45.9                                                                                | 45.9                                                                                | 45.9                                                                                | 24.1                                                                                | 70.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 30.0%                                                                             | 30.0%                                                                             | 0.0%                                                                              | 30.0%                                                                             | 30.0%                                                                             | 24.1%                                                                             | 45.9%                                                                               | 45.9%                                                                               | 45.9%                                                                               | 24.1%                                                                               | 70.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 3.0                                                                               | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 | 3.0                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 1.0                                                                               | 1.8                                                                                 | 1.8                                                                                 | 1.8                                                                                 | 1.0                                                                                 | 1.8                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 5.7                                                                                 | 5.7                                                                                 | 5.7                                                                                 | 4.0                                                                                 | 5.7                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lead                                                                              | Lag                                                                                 | Lag                                                                                 | Lag                                                                                 | Lead                                                                                |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                               | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 |                                                                                     |                                                                                     |
| Recall Mode             | None                                                                              | None                                                                              |                                                                                   | None                                                                              | None                                                                              | None                                                                              | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               | None                                                                                | C-Min                                                                               |                                                                                     |
| Act Effect Green (s)    | 18.6                                                                              | 18.6                                                                              |                                                                                   | 18.6                                                                              | 18.6                                                                              | 41.3                                                                              | 49.0                                                                                | 49.0                                                                                | 49.0                                                                                | 71.4                                                                                | 69.7                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.19                                                                              | 0.19                                                                              |                                                                                   | 0.19                                                                              | 0.19                                                                              | 0.41                                                                              | 0.49                                                                                | 0.49                                                                                | 0.49                                                                                | 0.71                                                                                | 0.70                                                                                |                                                                                     |
| v/c Ratio               | 0.54                                                                              | 0.45                                                                              |                                                                                   | 0.81                                                                              | 0.32                                                                              | 0.52                                                                              | 0.39                                                                                | 0.28                                                                                | 0.11                                                                                | 0.69                                                                                | 0.82                                                                                |                                                                                     |
| Control Delay           | 44.2                                                                              | 37.3                                                                              |                                                                                   | 67.7                                                                              | 36.4                                                                              | 8.5                                                                               | 42.6                                                                                | 17.5                                                                                | 4.9                                                                                 | 11.2                                                                                | 12.4                                                                                |                                                                                     |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.5                                                                                 |                                                                                     |
| Total Delay             | 44.2                                                                              | 37.3                                                                              |                                                                                   | 67.7                                                                              | 36.4                                                                              | 8.5                                                                               | 42.6                                                                                | 17.5                                                                                | 4.9                                                                                 | 11.2                                                                                | 12.9                                                                                |                                                                                     |
| LOS                     | D                                                                                 | D                                                                                 |                                                                                   | E                                                                                 | D                                                                                 | A                                                                                 | D                                                                                   | B                                                                                   | A                                                                                   | B                                                                                   | B                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 40.4                                                                              |                                                                                   |                                                                                   | 28.0                                                                              |                                                                                   |                                                                                     | 17.0                                                                                |                                                                                     |                                                                                     | 12.6                                                                                |                                                                                     |
| Approach LOS            |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | C                                                                                 |                                                                                   |                                                                                     | B                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 72                                                                                | 84                                                                                |                                                                                   | 93                                                                                | 57                                                                                | 45                                                                                | 11                                                                                  | 94                                                                                  | 0                                                                                   | 97                                                                                  | 338                                                                                 |                                                                                     |
| Queue Length 95th (ft)  | 125                                                                               | 137                                                                               |                                                                                   | #162                                                                              | 101                                                                               | 104                                                                               | #55                                                                                 | 146                                                                                 | 28                                                                                  | 180                                                                                 | 386                                                                                 |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 291                                                                               |                                                                                   |                                                                                   | 261                                                                               |                                                                                   |                                                                                    | 534                                                                                 |                                                                                     |                                                                                     | 378                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 150                                                                               |                                                                                   |                                                                                   | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 303                                                                               | 448                                                                               |                                                                                   | 245                                                                               | 414                                                                               | 727                                                                               | 70                                                                                 | 1652                                                                                | 715                                                                                 | 702                                                                                 | 2369                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 2                                                                                   | 130                                                                                 |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.42                                                                              | 0.35                                                                              |                                                                                   | 0.62                                                                              | 0.25                                                                              | 0.49                                                                              | 0.39                                                                               | 0.28                                                                                | 0.11                                                                                | 0.66                                                                                | 0.87                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 38 (38%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.82

Intersection Signal Delay: 17.7

Intersection LOS: B

Intersection Capacity Utilization 91.0%

ICU Level of Service F

Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 1: Divide Ave & Bismarck Expy

|                                                                                        |                                                                                          |
|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
|  ø2 |  ø4 |
| 70 s                                                                                   | 30 s                                                                                     |
|  ø5 |  ø8 |
| 24.1 s                                                                                 | 30 s                                                                                     |
|  ø6 |                                                                                          |
| 45.9 s                                                                                 |                                                                                          |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |                                                                                   |  |                                                                                   |                                                                                   |                                                                                   |                                                                                    |  |  |                                                                                     |  |  |
| Volume (vph)            | 178                                                                               | 0                                                                                 | 720                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 788                                                                                 | 115                                                                                 | 0                                                                                   | 1178                                                                                | 30                                                                                  |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                 | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 200                                                                               |                                                                                   | 200                                                                               | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     | 222                                                                                 |
| Storage Lanes           | 2                                                                                 |                                                                                   | 2                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  |                                                                                     | 1                                                                                   | 0                                                                                   |                                                                                     | 1                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 300                                                                               | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                 |                                                                                     | 25                                                                                  | 150                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                    |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                    | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 575                                                                               |                                                                                   |                                                                                   | 383                                                                               |                                                                                   |                                                                                    | 458                                                                                 |                                                                                     |                                                                                     | 769                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 13.1                                                                              |                                                                                   |                                                                                   | 8.7                                                                               |                                                                                   |                                                                                    | 7.8                                                                                 |                                                                                     |                                                                                     | 13.1                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                               | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                               | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 3%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                 | 8%                                                                                  | 27%                                                                                 | 10%                                                                                 | 9%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 193                                                                               | 0                                                                                 | 783                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 857                                                                                 | 125                                                                                 | 0                                                                                   | 1280                                                                                | 33                                                                                  |
| Turn Type               | custom                                                                            |                                                                                   | custom                                                                            |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     | Perm                                                                                |                                                                                     |                                                                                     | Free                                                                                |
| Protected Phases        |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     | 6                                                                                   |                                                                                     |                                                                                     | Free                                                                                |
| Detector Phase          | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                   | 6                                                                                   |                                                                                     | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               |                                                                                   | 6.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6.0                                                                                 | 6.0                                                                                 |                                                                                     | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 21.1                                                                              |                                                                                   | 21.1                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 23.4                                                                                | 23.4                                                                                |                                                                                     | 21.4                                                                                |                                                                                     |
| Total Split (s)         | 42.0                                                                              | 0.0                                                                               | 42.0                                                                              | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 58.0                                                                                | 58.0                                                                                | 0.0                                                                                 | 58.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 42.0%                                                                             | 0.0%                                                                              | 42.0%                                                                             | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                               | 58.0%                                                                               | 58.0%                                                                               | 0.0%                                                                                | 58.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.6                                                                               |                                                                                   | 3.6                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 3.9                                                                                 | 3.9                                                                                 |                                                                                     | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 1.5                                                                               |                                                                                   | 1.5                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 1.5                                                                                 | 1.5                                                                                 |                                                                                     | 1.5                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 5.1                                                                               | 4.0                                                                               | 5.1                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                                | 5.4                                                                                 | 5.4                                                                                 | 4.0                                                                                 | 5.4                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Recall Mode             | None                                                                              |                                                                                   | None                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | C-Min                                                                               | C-Min                                                                               |                                                                                     | C-Min                                                                               |                                                                                     |
| Act Effct Green (s)     | 31.5                                                                              |                                                                                   | 31.5                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 58.0                                                                                | 58.0                                                                                |                                                                                     | 58.0                                                                                | 100.0                                                                               |
| Actuated g/C Ratio      | 0.32                                                                              |                                                                                   | 0.32                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.58                                                                                | 0.58                                                                                |                                                                                     | 0.58                                                                                | 1.00                                                                                |
| v/c Ratio               | 0.18                                                                              |                                                                                   | 0.84                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.44                                                                                | 0.16                                                                                |                                                                                     | 0.67                                                                                | 0.02                                                                                |
| Control Delay           | 24.2                                                                              |                                                                                   | 37.6                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 12.3                                                                                | 3.9                                                                                 |                                                                                     | 10.8                                                                                | 0.0                                                                                 |
| Queue Delay             | 0.0                                                                               |                                                                                   | 0.2                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.1                                                                                 | 0.0                                                                                 |                                                                                     | 0.1                                                                                 | 0.0                                                                                 |
| Total Delay             | 24.2                                                                              |                                                                                   | 37.8                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 12.4                                                                                | 3.9                                                                                 |                                                                                     | 10.9                                                                                | 0.0                                                                                 |
| LOS                     | C                                                                                 |                                                                                   | D                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | B                                                                                   | A                                                                                   |                                                                                     | B                                                                                   | A                                                                                   |
| Approach Delay          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 11.3                                                                                |                                                                                     |                                                                                     | 10.7                                                                                |                                                                                     |
| Approach LOS            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | B                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 45                                                                                |                                                                                   | 238                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 117                                                                                 | 5                                                                                   |                                                                                     | 178                                                                                 | 0                                                                                   |
| Queue Length 95th (ft)  | 66                                                                                |                                                                                   | 298                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 163                                                                                 | 21                                                                                  |                                                                                     | 318                                                                                 | m0                                                                                  |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 495                                                                               |                                                                                   |                                                                                   | 303                                                                               |                                                                                   |                                                                                    | 378                                                                                 |                                                                                     |                                                                                     | 689                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 200                                                                               |                                                                                   | 200                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     | 222                                                                                 |
| Base Capacity (vph)     | 1255                                                                              |                                                                                   | 1074                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 1938                                                                                | 790                                                                                 |                                                                                     | 1920                                                                                | 1583                                                                                |
| Starvation Cap Reductn  | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 310                                                                                 | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   | 0                                                                                 |                                                                                   | 29                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   |                                                                                     | 104                                                                                 | 0                                                                                   |
| Storage Cap Reductn     | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       | 0.15                                                                              |                                                                                   | 0.75                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.53                                                                                | 0.16                                                                                |                                                                                     | 0.70                                                                                | 0.02                                                                                |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 32 (32%), Referenced to phase 2:SBT and 6:NBT, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.84

Intersection Signal Delay: 18.2

Intersection LOS: B

Intersection Capacity Utilization 66.5%

ICU Level of Service C

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: South Ramp & Centennial Rd

|                                                                                        |                                                                                       |
|----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|  ø2  |  ø4 |
| 58 s                                                                                   | 42 s                                                                                  |
|  ø6 |                                                                                       |
| 58 s                                                                                   |                                                                                       |

|                         |  |      |      |                                                                                   |      |                                                                                   |      |                                                                                     |                                                                                     |      |                                                                                     |                                                                                     |
|-------------------------|------------------------------------------------------------------------------------|------|------|-----------------------------------------------------------------------------------|------|-----------------------------------------------------------------------------------|------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                                | EBT  | EBR  | WBL                                                                               | WBT  | WBR                                                                               | NBL  | NBT                                                                                 | NBR                                                                                 | SBL  | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |                                                                                    |      |      |  |      |  |      |  |  |      |  |  |
| Volume (vph)            | 0                                                                                  | 0    | 0    | 175                                                                               | 0    | 17                                                                                | 0    | 605                                                                                 | 471                                                                                 | 0    | 1949                                                                                | 435                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                               | 1900 | 1900 | 1900                                                                              | 1900 | 1900                                                                              | 1900 | 1900                                                                                | 1900                                                                                | 1900 | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                 | 12   | 12   | 16                                                                                | 12   | 12                                                                                | 12   | 12                                                                                  | 12                                                                                  | 12   | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                    | 0%   |      |                                                                                   | 0%   |                                                                                   |      | 0%                                                                                  |                                                                                     |      | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 0                                                                                  |      | 0    | 0                                                                                 |      | 150                                                                               | 0    |                                                                                     | 215                                                                                 | 0    |                                                                                     | 200                                                                                 |
| Storage Lanes           | 0                                                                                  |      | 0    | 1                                                                                 |      | 1                                                                                 | 0    |                                                                                     | 1                                                                                   | 0    |                                                                                     | 1                                                                                   |
| Taper Length (ft)       | 25                                                                                 |      | 25   | 25                                                                                |      | 100                                                                               | 150  |                                                                                     | 25                                                                                  | 25   |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                    |      | Yes  |                                                                                   |      | Yes                                                                               |      |                                                                                     | Yes                                                                                 |      |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                    | 30   |      |                                                                                   | 30   |                                                                                   |      | 40                                                                                  |                                                                                     |      | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                    | 270  |      |                                                                                   | 465  |                                                                                   |      | 769                                                                                 |                                                                                     |      | 776                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                    | 6.1  |      |                                                                                   | 10.6 |                                                                                   |      | 13.1                                                                                |                                                                                     |      | 13.2                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                    |      |      |                                                                                   |      |                                                                                   |      |                                                                                     |                                                                                     |      |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                    |      |      |                                                                                   |      |                                                                                   |      |                                                                                     |                                                                                     |      |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                               | 0.92 | 0.92 | 0.92                                                                              | 0.92 | 0.92                                                                              | 0.92 | 0.92                                                                                | 0.92                                                                                | 0.92 | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                               | 100% | 100% | 100%                                                                              | 100% | 100%                                                                              | 100% | 100%                                                                                | 100%                                                                                | 100% | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                 | 2%   | 2%   | 12%                                                                               | 2%   | 8%                                                                                | 6%   | 3%                                                                                  | 2%                                                                                  | 2%   | 3%                                                                                  | 1%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                  | 0    | 0    | 0                                                                                 | 0    | 0                                                                                 | 0    | 0                                                                                   | 0                                                                                   | 0    | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                    |      |      |                                                                                   |      |                                                                                   |      |                                                                                     |                                                                                     |      |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                    | 0%   |      |                                                                                   | 0%   |                                                                                   |      | 0%                                                                                  |                                                                                     |      | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                    |      |      |                                                                                   |      |                                                                                   |      |                                                                                     |                                                                                     |      |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 0                                                                                  | 0    | 0    | 190                                                                               | 0    | 18                                                                                | 0    | 658                                                                                 | 512                                                                                 | 0    | 2118                                                                                | 473                                                                                 |
| Turn Type               |                                                                                    |      |      | custom                                                                            |      | custom                                                                            |      |                                                                                     | Free                                                                                |      |                                                                                     | Perm                                                                                |
| Protected Phases        |                                                                                    |      |      |                                                                                   |      |                                                                                   |      | 6                                                                                   |                                                                                     |      | 2                                                                                   |                                                                                     |
| Permitted Phases        |                                                                                    |      |      | 8                                                                                 |      | 8                                                                                 |      |                                                                                     | Free                                                                                |      |                                                                                     | 2                                                                                   |
| Detector Phase          |                                                                                    |      |      | 8                                                                                 |      | 8                                                                                 |      | 6                                                                                   |                                                                                     |      | 2                                                                                   | 2                                                                                   |
| Switch Phase            |                                                                                    |      |      |                                                                                   |      |                                                                                   |      |                                                                                     |                                                                                     |      |                                                                                     |                                                                                     |
| Minimum Initial (s)     |                                                                                    |      |      | 5.0                                                                               |      | 5.0                                                                               |      | 10.0                                                                                |                                                                                     |      | 10.0                                                                                | 10.0                                                                                |
| Minimum Split (s)       |                                                                                    |      |      | 20.0                                                                              |      | 20.0                                                                              |      | 20.0                                                                                |                                                                                     |      | 22.4                                                                                | 22.4                                                                                |
| Total Split (s)         | 0.0                                                                                | 0.0  | 0.0  | 21.0                                                                              | 0.0  | 21.0                                                                              | 0.0  | 79.0                                                                                | 0.0                                                                                 | 0.0  | 79.0                                                                                | 79.0                                                                                |
| Total Split (%)         | 0.0%                                                                               | 0.0% | 0.0% | 21.0%                                                                             | 0.0% | 21.0%                                                                             | 0.0% | 79.0%                                                                               | 0.0%                                                                                | 0.0% | 79.0%                                                                               | 79.0%                                                                               |
| Yellow Time (s)         |                                                                                    |      |      | 3.2                                                                               |      | 3.2                                                                               |      | 3.9                                                                                 |                                                                                     |      | 3.9                                                                                 | 3.9                                                                                 |
| All-Red Time (s)        |                                                                                    |      |      | 2.0                                                                               |      | 2.0                                                                               |      | 1.5                                                                                 |                                                                                     |      | 1.5                                                                                 | 1.5                                                                                 |
| Lost Time Adjust (s)    | 0.0                                                                                | 0.0  | 0.0  | 0.0                                                                               | 0.0  | 0.0                                                                               | 0.0  | 0.0                                                                                 | 0.0                                                                                 | 0.0  | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                                | 4.0  | 4.0  | 5.2                                                                               | 4.0  | 5.2                                                                               | 4.0  | 5.4                                                                                 | 4.0                                                                                 | 4.0  | 5.4                                                                                 | 5.4                                                                                 |
| Lead/Lag                |                                                                                    |      |      |                                                                                   |      |                                                                                   |      |                                                                                     |                                                                                     |      |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                    |      |      |                                                                                   |      |                                                                                   |      |                                                                                     |                                                                                     |      |                                                                                     |                                                                                     |
| Recall Mode             |                                                                                    |      |      | None                                                                              |      | None                                                                              |      | C-Min                                                                               |                                                                                     |      | C-Min                                                                               | C-Min                                                                               |
| Act Effect Green (s)    |                                                                                    |      |      | 13.6                                                                              |      | 13.6                                                                              |      | 75.8                                                                                | 100.0                                                                               |      | 75.8                                                                                | 75.8                                                                                |
| Actuated g/C Ratio      |                                                                                    |      |      | 0.14                                                                              |      | 0.14                                                                              |      | 0.76                                                                                | 1.00                                                                                |      | 0.76                                                                                | 0.76                                                                                |
| v/c Ratio               |                                                                                    |      |      | 0.77                                                                              |      | 0.08                                                                              |      | 0.25                                                                                | 0.32                                                                                |      | 0.80                                                                                | 0.36                                                                                |
| Control Delay           |                                                                                    |      |      | 61.4                                                                              |      | 16.5                                                                              |      | 2.5                                                                                 | 0.6                                                                                 |      | 2.3                                                                                 | 0.4                                                                                 |
| Queue Delay             |                                                                                    |      |      | 0.0                                                                               |      | 0.0                                                                               |      | 0.0                                                                                 | 0.0                                                                                 |      | 0.3                                                                                 | 0.0                                                                                 |
| Total Delay             |                                                                                    |      |      | 61.4                                                                              |      | 16.5                                                                              |      | 2.5                                                                                 | 0.6                                                                                 |      | 2.6                                                                                 | 0.4                                                                                 |
| LOS                     |                                                                                    |      |      | E                                                                                 |      | B                                                                                 |      | A                                                                                   | A                                                                                   |      | A                                                                                   | A                                                                                   |
| Approach Delay          |                                                                                    |      |      |                                                                                   |      |                                                                                   |      | 1.7                                                                                 |                                                                                     |      | 2.2                                                                                 |                                                                                     |
| Approach LOS            |                                                                                    |      |      |                                                                                   |      |                                                                                   |      | A                                                                                   |                                                                                     |      | A                                                                                   |                                                                                     |
| Queue Length 50th (ft)  |                                                                                    |      |      | 117                                                                               |      | 0                                                                                 |      | 33                                                                                  | 0                                                                                   |      | 111                                                                                 | 2                                                                                   |
| Queue Length 95th (ft)  |                                                                                    |      |      | #193                                                                              |      | 20                                                                                |      | 38                                                                                  | 0                                                                                   |      | m93                                                                                 | m0                                                                                  |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 190                                                                               |                                                                                   |                                                                                   | 385                                                                               |                                                                                   |                                                                                     | 689                                                                                 |                                                                                     |                                                                                     | 696                                                                                 |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 150                                                                               |                                                                                     |                                                                                     | 215                                                                                 |                                                                                     |                                                                                     | 200                                                                                 |
| Base Capacity (vph)     |                                                                                   |                                                                                   |                                                                                   | 289                                                                               |                                                                                   | 251                                                                               |                                                                                     | 2657                                                                                | 1583                                                                                |                                                                                     | 2657                                                                                | 1327                                                                                |
| Starvation Cap Reductn  |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     | 118                                                                                 | 0                                                                                   |
| Spillback Cap Reductn   |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       |                                                                                   |                                                                                   |                                                                                   | 0.66                                                                              |                                                                                   | 0.07                                                                              |                                                                                     | 0.25                                                                                | 0.32                                                                                |                                                                                     | 0.83                                                                                | 0.36                                                                                |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 3 (3%), Referenced to phase 2:SBT and 6:NBT, Start of Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.80

Intersection Signal Delay: 4.9

Intersection LOS: A

Intersection Capacity Utilization 71.4%

ICU Level of Service C

Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: North Ramp & Centennial Rd



|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |                                                                                   |  |  |  |  |                                                                                   |  |  |                                                                                     |  |  |                                                                                     |
| Volume (vph)            | 12                                                                                | 2                                                                                 | 369                                                                               | 155                                                                               | 8                                                                                 | 69                                                                                | 129                                                                                 | 551                                                                                 | 130                                                                                 | 35                                                                                  | 1871                                                                                | 31                                                                                  |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 0                                                                                 |                                                                                   | 200                                                                               | 200                                                                               |                                                                                   | 200                                                                               | 530                                                                                 |                                                                                     | 0                                                                                   | 215                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 0                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                   |                                                                                     | 0                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                  |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 709                                                                               |                                                                                   |                                                                                   | 951                                                                               |                                                                                   |                                                                                     | 776                                                                                 |                                                                                     |                                                                                     | 1318                                                                                |                                                                                     |
| Travel Time (s)         |                                                                                   | 16.1                                                                              |                                                                                   |                                                                                   | 21.6                                                                              |                                                                                   |                                                                                     | 13.2                                                                                |                                                                                     |                                                                                     | 22.5                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 0                                                                                 | 15                                                                                | 401                                                                               | 168                                                                               | 84                                                                                | 0                                                                                 | 140                                                                                 | 740                                                                                 | 0                                                                                   | 38                                                                                  | 2068                                                                                | 0                                                                                   |
| Turn Type               | Perm                                                                              |                                                                                   | Perm                                                                              | Perm                                                                              |                                                                                   |                                                                                   | pm+pt                                                                               |                                                                                     |                                                                                     | Perm                                                                                |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 | 8                                                                                 |                                                                                   |                                                                                   | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 | 4                                                                                 | 4                                                                                 | 8                                                                                 | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     | 2                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               |                                                                                   | 5.0                                                                                 | 4.0                                                                                 |                                                                                     | 4.0                                                                                 | 4.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              |                                                                                   | 9.0                                                                                 | 20.0                                                                                |                                                                                     | 20.0                                                                                | 20.0                                                                                |                                                                                     |
| Total Split (s)         | 25.0                                                                              | 25.0                                                                              | 25.0                                                                              | 25.0                                                                              | 25.0                                                                              | 0.0                                                                               | 12.0                                                                                | 75.0                                                                                | 0.0                                                                                 | 63.0                                                                                | 63.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 25.0%                                                                             | 25.0%                                                                             | 25.0%                                                                             | 25.0%                                                                             | 25.0%                                                                             | 0.0%                                                                              | 12.0%                                                                               | 75.0%                                                                               | 0.0%                                                                                | 63.0%                                                                               | 63.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               |                                                                                   | 3.5                                                                                 | 3.5                                                                                 |                                                                                     | 3.5                                                                                 | 3.5                                                                                 |                                                                                     |
| All-Red Time (s)        | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               |                                                                                   | 0.5                                                                                 | 0.5                                                                                 |                                                                                     | 0.5                                                                                 | 0.5                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lag                                                                                 |                                                                                     |                                                                                     | Lead                                                                                | Lead                                                                                |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 | Yes                                                                                 |                                                                                     |
| Recall Mode             | None                                                                              | None                                                                              | None                                                                              | None                                                                              | None                                                                              |                                                                                   | None                                                                                | C-Min                                                                               |                                                                                     | C-Min                                                                               | C-Min                                                                               |                                                                                     |
| Act Effct Green (s)     |                                                                                   | 20.2                                                                              | 20.2                                                                              | 20.2                                                                              | 20.2                                                                              |                                                                                   | 71.8                                                                                | 71.8                                                                                |                                                                                     | 60.5                                                                                | 60.5                                                                                |                                                                                     |
| Actuated g/C Ratio      |                                                                                   | 0.20                                                                              | 0.20                                                                              | 0.20                                                                              | 0.20                                                                              |                                                                                   | 0.72                                                                                | 0.72                                                                                |                                                                                     | 0.60                                                                                | 0.60                                                                                |                                                                                     |
| v/c Ratio               |                                                                                   | 0.05                                                                              | 0.93                                                                              | 0.60                                                                              | 0.22                                                                              |                                                                                   | 0.69                                                                                | 0.30                                                                                |                                                                                     | 0.10                                                                                | 0.97                                                                                |                                                                                     |
| Control Delay           |                                                                                   | 32.1                                                                              | 55.7                                                                              | 45.6                                                                              | 11.0                                                                              |                                                                                   | 39.8                                                                                | 4.4                                                                                 |                                                                                     | 2.5                                                                                 | 11.5                                                                                |                                                                                     |
| Queue Delay             |                                                                                   | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                                 | 0.0                                                                                 |                                                                                     | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |
| Total Delay             |                                                                                   | 32.1                                                                              | 55.7                                                                              | 45.6                                                                              | 11.0                                                                              |                                                                                   | 39.8                                                                                | 4.4                                                                                 |                                                                                     | 2.5                                                                                 | 11.5                                                                                |                                                                                     |
| LOS                     |                                                                                   | C                                                                                 | E                                                                                 | D                                                                                 | B                                                                                 |                                                                                   | D                                                                                   | A                                                                                   |                                                                                     | A                                                                                   | B                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 54.8                                                                              |                                                                                   |                                                                                   | 34.1                                                                              |                                                                                   |                                                                                     | 10.1                                                                                |                                                                                     |                                                                                     | 11.3                                                                                |                                                                                     |
| Approach LOS            |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | C                                                                                 |                                                                                   |                                                                                     | B                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| Queue Length 50th (ft)  |                                                                                   | 8                                                                                 | 170                                                                               | 97                                                                                | 5                                                                                 |                                                                                   | 15                                                                                  | 30                                                                                  |                                                                                     | 4                                                                                   | 339                                                                                 |                                                                                     |
| Queue Length 95th (ft)  |                                                                                   | 25                                                                                | #351                                                                              | 167                                                                               | 44                                                                                |                                                                                   | #111                                                                                | 85                                                                                  |                                                                                     | m3                                                                                  | m220                                                                                |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 629                                                                               |                                                                                   |                                                                                   | 871                                                                               |                                                                                   |                                                                                    | 696                                                                                 |                                                                                     |                                                                                     | 1238                                                                                |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   | 200                                                                               | 200                                                                               |                                                                                   |                                                                                   | 530                                                                                |                                                                                     |                                                                                     | 215                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     |                                                                                   | 327                                                                               | 445                                                                               | 296                                                                               | 401                                                                               |                                                                                   | 216                                                                                | 2495                                                                                |                                                                                     | 390                                                                                 | 2137                                                                                |                                                                                     |
| Starvation Cap Reductn  |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       |                                                                                   | 0.05                                                                              | 0.90                                                                              | 0.57                                                                              | 0.21                                                                              |                                                                                   | 0.65                                                                               | 0.30                                                                                |                                                                                     | 0.10                                                                                | 0.97                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 4 (4%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.97

Intersection Signal Delay: 17.5

Intersection LOS: B

Intersection Capacity Utilization 94.1%

ICU Level of Service F

Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Trenton Dr & Centennial Rd

|                                                                                        |                                                                                         |                                                                                          |
|----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
|  ø2 |  ø1 |  ø4 |
| 63 s                                                                                   | 12 s                                                                                    | 25 s                                                                                     |
|  ø6 |                                                                                         |  ø8 |
| 75 s                                                                                   |                                                                                         | 25 s                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |  |  |  |  |  |  |                                                                                     |  |  |  |
| Volume (vph)            | 31                                                                                | 42                                                                                | 271                                                                               | 1158                                                                              | 479                                                                               | 63                                                                                | 176                                                                                 | 386                                                                                 | 37                                                                                  | 40                                                                                  | 1738                                                                                | 156                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                                 |                                                                                     | 0                                                                                   | 215                                                                                 |                                                                                     | 215                                                                                 |
| Storage Lanes           | 1                                                                                 |                                                                                   | 1                                                                                 | 2                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                   |                                                                                     | 0                                                                                   | 1                                                                                   |                                                                                     | 1                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                  |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 35                                                                                |                                                                                   |                                                                                   | 35                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 805                                                                               |                                                                                   |                                                                                   | 659                                                                               |                                                                                   |                                                                                     | 1318                                                                                |                                                                                     |                                                                                     | 490                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 15.7                                                                              |                                                                                   |                                                                                   | 12.8                                                                              |                                                                                   |                                                                                     | 22.5                                                                                |                                                                                     |                                                                                     | 8.4                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 34                                                                                | 46                                                                                | 295                                                                               | 1259                                                                              | 521                                                                               | 68                                                                                | 191                                                                                 | 460                                                                                 | 0                                                                                   | 43                                                                                  | 1889                                                                                | 170                                                                                 |
| Turn Type               | pm+pt                                                                             |                                                                                   | Perm                                                                              | pm+pt                                                                             |                                                                                   | Perm                                                                              | pm+pt                                                                               |                                                                                     |                                                                                     | pm+pt                                                                               |                                                                                     | Perm                                                                                |
| Protected Phases        | 7                                                                                 | 4                                                                                 |                                                                                   | 3                                                                                 | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     | 2                                                                                   |
| Detector Phase          | 7                                                                                 | 4                                                                                 | 4                                                                                 | 3                                                                                 | 8                                                                                 | 8                                                                                 | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   | 2                                                                                   |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 4.0                                                                               | 10.0                                                                              | 10.0                                                                              | 4.0                                                                               | 10.0                                                                              | 10.0                                                                              | 4.0                                                                                 | 6.0                                                                                 |                                                                                     | 4.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 |
| Minimum Split (s)       | 8.0                                                                               | 15.7                                                                              | 15.7                                                                              | 8.0                                                                               | 15.7                                                                              | 15.7                                                                              | 8.0                                                                                 | 11.5                                                                                |                                                                                     | 8.0                                                                                 | 11.5                                                                                | 11.5                                                                                |
| Total Split (s)         | 12.0                                                                              | 17.0                                                                              | 17.0                                                                              | 26.0                                                                              | 31.0                                                                              | 31.0                                                                              | 12.0                                                                                | 45.0                                                                                | 0.0                                                                                 | 12.0                                                                                | 45.0                                                                                | 45.0                                                                                |
| Total Split (%)         | 12.0%                                                                             | 17.0%                                                                             | 17.0%                                                                             | 26.0%                                                                             | 31.0%                                                                             | 31.0%                                                                             | 12.0%                                                                               | 45.0%                                                                               | 0.0%                                                                                | 12.0%                                                                               | 45.0%                                                                               | 45.0%                                                                               |
| Yellow Time (s)         | 3.5                                                                               | 3.9                                                                               | 3.9                                                                               | 3.5                                                                               | 3.9                                                                               | 3.9                                                                               | 3.5                                                                                 | 3.6                                                                                 |                                                                                     | 3.5                                                                                 | 3.6                                                                                 | 3.6                                                                                 |
| All-Red Time (s)        | 0.5                                                                               | 1.8                                                                               | 1.8                                                                               | 0.5                                                                               | 1.8                                                                               | 1.8                                                                               | 0.5                                                                                 | 1.9                                                                                 |                                                                                     | 0.5                                                                                 | 1.9                                                                                 | 1.9                                                                                 |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 5.7                                                                               | 5.7                                                                               | 4.0                                                                               | 5.7                                                                               | 5.7                                                                               | 4.0                                                                                 | 5.5                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 5.5                                                                                 | 5.5                                                                                 |
| Lead/Lag                | Lead                                                                              | Lead                                                                              | Lead                                                                              | Lag                                                                               | Lag                                                                               | Lag                                                                               | Lag                                                                                 | Lag                                                                                 |                                                                                     | Lead                                                                                | Lead                                                                                | Lead                                                                                |
| Lead-Lag Optimize?      | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                                 | Yes                                                                                 |                                                                                     | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 |
| Recall Mode             | None                                                                              | Max                                                                               | Max                                                                               | None                                                                              | Max                                                                               | Max                                                                               | None                                                                                | C-Max                                                                               |                                                                                     | None                                                                                | C-Max                                                                               | C-Max                                                                               |
| Act Effect Green (s)    | 13.0                                                                              | 11.3                                                                              | 11.3                                                                              | 32.0                                                                              | 30.3                                                                              | 30.3                                                                              | 46.2                                                                                | 44.7                                                                                |                                                                                     | 41.0                                                                                | 39.5                                                                                | 39.5                                                                                |
| Actuated g/C Ratio      | 0.13                                                                              | 0.11                                                                              | 0.11                                                                              | 0.32                                                                              | 0.30                                                                              | 0.30                                                                              | 0.46                                                                                | 0.45                                                                                |                                                                                     | 0.41                                                                                | 0.40                                                                                | 0.40                                                                                |
| v/c Ratio               | 0.18                                                                              | 0.12                                                                              | 1.05                                                                              | 1.24                                                                              | 0.49                                                                              | 0.13                                                                              | 0.84                                                                                | 0.29                                                                                |                                                                                     | 0.12                                                                                | 1.35                                                                                | 0.25                                                                                |
| Control Delay           | 41.1                                                                              | 40.7                                                                              | 95.2                                                                              | 148.3                                                                             | 31.7                                                                              | 8.1                                                                               | 63.3                                                                                | 16.4                                                                                |                                                                                     | 18.8                                                                                | 191.0                                                                               | 10.0                                                                                |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 |                                                                                     | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             | 41.1                                                                              | 40.7                                                                              | 95.2                                                                              | 148.3                                                                             | 31.7                                                                              | 8.1                                                                               | 63.3                                                                                | 16.4                                                                                |                                                                                     | 18.8                                                                                | 191.0                                                                               | 10.0                                                                                |
| LOS                     | D                                                                                 | D                                                                                 | F                                                                                 | F                                                                                 | C                                                                                 | A                                                                                 | E                                                                                   | B                                                                                   |                                                                                     | B                                                                                   | F                                                                                   | A                                                                                   |
| Approach Delay          |                                                                                   | 83.6                                                                              |                                                                                   |                                                                                   | 110.2                                                                             |                                                                                   |                                                                                     | 30.2                                                                                |                                                                                     |                                                                                     | 172.8                                                                               |                                                                                     |
| Approach LOS            |                                                                                   | F                                                                                 |                                                                                   |                                                                                   | F                                                                                 |                                                                                   |                                                                                     | C                                                                                   |                                                                                     |                                                                                     | F                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 20                                                                                | 14                                                                                | ~136                                                                              | ~553                                                                              | 151                                                                               | 0                                                                                 | 78                                                                                  | 97                                                                                  |                                                                                     | 16                                                                                  | ~835                                                                                | 29                                                                                  |
| Queue Length 95th (ft)  | 49                                                                                | 31                                                                                | #305                                                                              | #691                                                                              | 207                                                                               | 33                                                                                | #219                                                                                | 110                                                                                 |                                                                                     | 38                                                                                  | #973                                                                                | 73                                                                                  |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 725                                                                               |                                                                                   |                                                                                   | 579                                                                               |                                                                                   |                                                                                     | 1238                                                                                |                                                                                     |                                                                                     | 410                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                                 |                                                                                     |                                                                                     | 215                                                                                 |                                                                                     | 215                                                                                 |
| Base Capacity (vph)     | 197                                                                               | 400                                                                               | 281                                                                               | 1016                                                                              | 1071                                                                              | 526                                                                               | 227                                                                                 | 1567                                                                                |                                                                                     | 370                                                                                 | 1398                                                                                | 685                                                                                 |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       | 0.17                                                                              | 0.12                                                                              | 1.05                                                                              | 1.24                                                                              | 0.49                                                                              | 0.13                                                                              | 0.84                                                                                | 0.29                                                                                |                                                                                     | 0.12                                                                                | 1.35                                                                                | 0.25                                                                                |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 13 (13%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 150

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.35

Intersection Signal Delay: 124.2

Intersection LOS: F

Intersection Capacity Utilization 110.5%

ICU Level of Service H

Analysis Period (min) 15

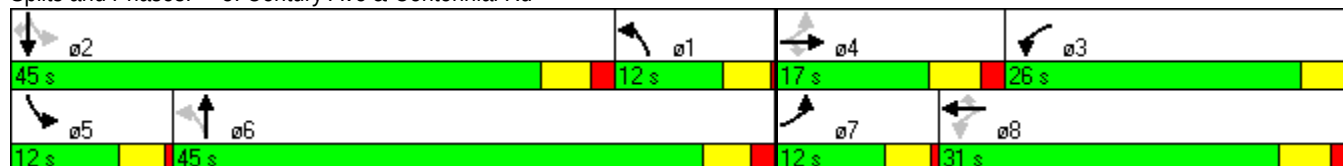
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 5: Century Ave & Centennial Rd





**Appendix W: 2035 - Signal at Trenton & NE/SW Loop Ramps PM (3D2)**

Exit 161 Operational Study  
Bismarck, ND

1: Divide Ave & Bismarck Expy

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |                                                                                   |  |  |  |  |  |  |  |  |  |
| Volume (vph)            | 295                                                                               | 58                                                                                | 26                                                                                | 112                                                                               | 92                                                                                | 410                                                                               | 24                                                                                  | 854                                                                                 | 60                                                                                  | 270                                                                                 | 1150                                                                                | 174                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 150                                                                               |                                                                                   | 0                                                                                 | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                 |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                   |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 100                                                                               |                                                                                   | 25                                                                                | 100                                                                               |                                                                                   | 100                                                                               | 100                                                                                 |                                                                                     | 150                                                                                 | 100                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 25                                                                                |                                                                                   |                                                                                   | 25                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 371                                                                               |                                                                                   |                                                                                   | 341                                                                               |                                                                                   |                                                                                     | 614                                                                                 |                                                                                     |                                                                                     | 458                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 10.1                                                                              |                                                                                   |                                                                                   | 9.3                                                                               |                                                                                   |                                                                                     | 10.5                                                                                |                                                                                     |                                                                                     | 7.8                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 4%                                                                                | 1%                                                                                | 1%                                                                                | 11%                                                                               | 10%                                                                               | 22%                                                                               | 10%                                                                                 | 7%                                                                                  | 17%                                                                                 | 11%                                                                                 | 4%                                                                                  | 4%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 321                                                                               | 91                                                                                | 0                                                                                 | 122                                                                               | 100                                                                               | 446                                                                               | 26                                                                                  | 928                                                                                 | 65                                                                                  | 293                                                                                 | 1439                                                                                | 0                                                                                   |
| Turn Type               | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                              |                                                                                   | pm+ov                                                                             | Perm                                                                                |                                                                                     | Perm                                                                                | pm+pt                                                                               |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 | 5                                                                                 |                                                                                     | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                   |                                                                                     | 6                                                                                   | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 | 4                                                                                 |                                                                                   | 8                                                                                 | 8                                                                                 | 5                                                                                 | 6                                                                                   | 6                                                                                   | 6                                                                                   | 5                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               | 6.0                                                                               |                                                                                   | 6.0                                                                               | 6.0                                                                               | 5.0                                                                               | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 5.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 30.0                                                                              | 30.0                                                                              |                                                                                   | 30.0                                                                              | 30.0                                                                              | 9.8                                                                               | 22.9                                                                                | 22.9                                                                                | 22.9                                                                                | 9.8                                                                                 | 28.7                                                                                |                                                                                     |
| Total Split (s)         | 37.0                                                                              | 37.0                                                                              | 0.0                                                                               | 37.0                                                                              | 37.0                                                                              | 23.0                                                                              | 40.0                                                                                | 40.0                                                                                | 40.0                                                                                | 23.0                                                                                | 63.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 37.0%                                                                             | 37.0%                                                                             | 0.0%                                                                              | 37.0%                                                                             | 37.0%                                                                             | 23.0%                                                                             | 40.0%                                                                               | 40.0%                                                                               | 40.0%                                                                               | 23.0%                                                                               | 63.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 3.0                                                                               | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 | 3.0                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 1.0                                                                               | 1.8                                                                                 | 1.8                                                                                 | 1.8                                                                                 | 1.0                                                                                 | 1.8                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 5.7                                                                                 | 5.7                                                                                 | 5.7                                                                                 | 4.0                                                                                 | 5.7                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lead                                                                              | Lag                                                                                 | Lag                                                                                 | Lag                                                                                 | Lead                                                                                |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                               | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 |                                                                                     |                                                                                     |
| Recall Mode             | None                                                                              | None                                                                              |                                                                                   | None                                                                              | None                                                                              | None                                                                              | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               | None                                                                                | C-Min                                                                               |                                                                                     |
| Act Effect Green (s)    | 28.3                                                                              | 28.3                                                                              |                                                                                   | 28.3                                                                              | 28.3                                                                              | 50.2                                                                              | 40.1                                                                                | 40.1                                                                                | 40.1                                                                                | 61.7                                                                                | 60.0                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.28                                                                              | 0.28                                                                              |                                                                                   | 0.28                                                                              | 0.28                                                                              | 0.50                                                                              | 0.40                                                                                | 0.40                                                                                | 0.40                                                                                | 0.62                                                                                | 0.60                                                                                |                                                                                     |
| v/c Ratio               | 0.90                                                                              | 0.17                                                                              |                                                                                   | 0.36                                                                              | 0.20                                                                              | 0.66                                                                              | 0.22                                                                                | 0.69                                                                                | 0.11                                                                                | 0.76                                                                                | 0.70                                                                                |                                                                                     |
| Control Delay           | 62.3                                                                              | 20.1                                                                              |                                                                                   | 31.1                                                                              | 27.3                                                                              | 21.5                                                                              | 29.8                                                                                | 29.6                                                                                | 6.4                                                                                 | 31.1                                                                                | 11.5                                                                                |                                                                                     |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.1                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.5                                                                                 |                                                                                     |
| Total Delay             | 62.3                                                                              | 20.1                                                                              |                                                                                   | 31.1                                                                              | 27.3                                                                              | 21.5                                                                              | 29.8                                                                                | 29.7                                                                                | 6.4                                                                                 | 31.1                                                                                | 12.0                                                                                |                                                                                     |
| LOS                     | E                                                                                 | C                                                                                 |                                                                                   | C                                                                                 | C                                                                                 | C                                                                                 | C                                                                                   | C                                                                                   | A                                                                                   | C                                                                                   | B                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 53.0                                                                              |                                                                                   |                                                                                   | 24.1                                                                              |                                                                                   |                                                                                     | 28.2                                                                                |                                                                                     |                                                                                     | 15.2                                                                                |                                                                                     |
| Approach LOS            |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | C                                                                                 |                                                                                   |                                                                                     | C                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 188                                                                               | 31                                                                                |                                                                                   | 59                                                                                | 46                                                                                | 167                                                                               | 12                                                                                  | 277                                                                                 | 0                                                                                   | 103                                                                                 | 263                                                                                 |                                                                                     |
| Queue Length 95th (ft)  | #336                                                                              | 69                                                                                |                                                                                   | 110                                                                               | 87                                                                                | 264                                                                               | 37                                                                                  | 358                                                                                 | 29                                                                                  | 189                                                                                 | 306                                                                                 |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 291                                                                               |                                                                                   |                                                                                   | 261                                                                               |                                                                                   |                                                                                    | 534                                                                                 |                                                                                     |                                                                                     | 378                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 150                                                                               |                                                                                   |                                                                                   | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 392                                                                               | 572                                                                               |                                                                                   | 370                                                                               | 535                                                                               | 719                                                                               | 117                                                                                | 1353                                                                                | 592                                                                                 | 429                                                                                 | 2052                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 226                                                                                 |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 32                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.82                                                                              | 0.16                                                                              |                                                                                   | 0.33                                                                              | 0.19                                                                              | 0.62                                                                              | 0.22                                                                               | 0.70                                                                                | 0.11                                                                                | 0.68                                                                                | 0.79                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 12 (12%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.90

Intersection Signal Delay: 24.3

Intersection LOS: C

Intersection Capacity Utilization 79.8%

ICU Level of Service D

Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 1: Divide Ave & Bismarck Expy



|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |                                                                                   |  |                                                                                   |                                                                                   |                                                                                   |                                                                                    |  |  |                                                                                     |  |  |
| Volume (vph)            | 394                                                                               | 0                                                                                 | 529                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 1584                                                                                | 155                                                                                 | 0                                                                                   | 724                                                                                 | 35                                                                                  |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                 | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 200                                                                               |                                                                                   | 200                                                                               | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     | 222                                                                                 |
| Storage Lanes           | 2                                                                                 |                                                                                   | 2                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  |                                                                                     | 1                                                                                   | 0                                                                                   |                                                                                     | 1                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 300                                                                               | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                 |                                                                                     | 25                                                                                  | 150                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                    |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                    | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 575                                                                               |                                                                                   |                                                                                   | 383                                                                               |                                                                                   |                                                                                    | 458                                                                                 |                                                                                     |                                                                                     | 769                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 13.1                                                                              |                                                                                   |                                                                                   | 8.7                                                                               |                                                                                   |                                                                                    | 7.8                                                                                 |                                                                                     |                                                                                     | 13.1                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                               | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                               | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 3%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                 | 8%                                                                                  | 27%                                                                                 | 10%                                                                                 | 9%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 428                                                                               | 0                                                                                 | 575                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 1722                                                                                | 168                                                                                 | 0                                                                                   | 787                                                                                 | 38                                                                                  |
| Turn Type               | custom                                                                            |                                                                                   | custom                                                                            |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     | Perm                                                                                |                                                                                     |                                                                                     | Free                                                                                |
| Protected Phases        |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     | 6                                                                                   |                                                                                     |                                                                                     | Free                                                                                |
| Detector Phase          | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                   | 6                                                                                   |                                                                                     | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               |                                                                                   | 6.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6.0                                                                                 | 6.0                                                                                 |                                                                                     | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 21.1                                                                              |                                                                                   | 21.1                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 23.4                                                                                | 23.4                                                                                |                                                                                     | 21.4                                                                                |                                                                                     |
| Total Split (s)         | 26.0                                                                              | 0.0                                                                               | 26.0                                                                              | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 74.0                                                                                | 74.0                                                                                | 0.0                                                                                 | 74.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 26.0%                                                                             | 0.0%                                                                              | 26.0%                                                                             | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                               | 74.0%                                                                               | 74.0%                                                                               | 0.0%                                                                                | 74.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.6                                                                               |                                                                                   | 3.6                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 3.9                                                                                 | 3.9                                                                                 |                                                                                     | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 1.5                                                                               |                                                                                   | 1.5                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 1.5                                                                                 | 1.5                                                                                 |                                                                                     | 1.5                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 5.1                                                                               | 4.0                                                                               | 5.1                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                                | 5.4                                                                                 | 5.4                                                                                 | 4.0                                                                                 | 5.4                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Recall Mode             | None                                                                              |                                                                                   | None                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | C-Min                                                                               | C-Min                                                                               |                                                                                     | C-Min                                                                               |                                                                                     |
| Act Effct Green (s)     | 18.2                                                                              |                                                                                   | 18.2                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 71.3                                                                                | 71.3                                                                                |                                                                                     | 71.3                                                                                | 100.0                                                                               |
| Actuated g/C Ratio      | 0.18                                                                              |                                                                                   | 0.18                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.71                                                                                | 0.71                                                                                |                                                                                     | 0.71                                                                                | 1.00                                                                                |
| v/c Ratio               | 0.69                                                                              |                                                                                   | 0.67                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.72                                                                                | 0.18                                                                                |                                                                                     | 0.33                                                                                | 0.02                                                                                |
| Control Delay           | 44.1                                                                              |                                                                                   | 13.5                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 7.0                                                                                 | 0.8                                                                                 |                                                                                     | 3.5                                                                                 | 0.0                                                                                 |
| Queue Delay             | 0.0                                                                               |                                                                                   | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 1.0                                                                                 | 0.0                                                                                 |                                                                                     | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             | 44.1                                                                              |                                                                                   | 13.5                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 8.0                                                                                 | 0.8                                                                                 |                                                                                     | 3.5                                                                                 | 0.0                                                                                 |
| LOS                     | D                                                                                 |                                                                                   | B                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | A                                                                                   | A                                                                                   |                                                                                     | A                                                                                   | A                                                                                   |
| Approach Delay          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 7.3                                                                                 |                                                                                     |                                                                                     | 3.4                                                                                 |                                                                                     |
| Approach LOS            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | A                                                                                   |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 130                                                                               |                                                                                   | 44                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 94                                                                                  | 1                                                                                   |                                                                                     | 45                                                                                  | 0                                                                                   |
| Queue Length 95th (ft)  | 178                                                                               |                                                                                   | 103                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 162                                                                                 | m5                                                                                  |                                                                                     | 68                                                                                  | 0                                                                                   |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 495                                                                               |                                                                                   |                                                                                   | 303                                                                               |                                                                                   |                                                                                    | 378                                                                                 |                                                                                     |                                                                                     | 689                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 200                                                                               |                                                                                   | 200                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     | 222                                                                                 |
| Base Capacity (vph)     | 711                                                                               |                                                                                   | 923                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 2382                                                                                | 955                                                                                 |                                                                                     | 2360                                                                                | 1583                                                                                |
| Starvation Cap Reductn  | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 372                                                                                 | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       | 0.60                                                                              |                                                                                   | 0.62                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.86                                                                                | 0.18                                                                                |                                                                                     | 0.33                                                                                | 0.02                                                                                |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 11 (11%), Referenced to phase 2:SBT and 6:NBT, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.72

Intersection Signal Delay: 11.6

Intersection LOS: B

Intersection Capacity Utilization 62.9%

ICU Level of Service B

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: South Ramp & Centennial Rd

|                                                                                     |    |  |                                                                                      |    |
|-------------------------------------------------------------------------------------|----|--|--------------------------------------------------------------------------------------|----|
|   | ø2 |  |  | ø4 |
| 74 s                                                                                |    |  | 26 s                                                                                 |    |
|  | ø6 |  |                                                                                      |    |
| 74 s                                                                                |    |  |                                                                                      |    |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |                                                                                   |                                                                                   |                                                                                   |  |                                                                                   |  |                                                                                     |  |  |  |  |  |
| Volume (vph)            | 0                                                                                 | 0                                                                                 | 0                                                                                 | 92                                                                                | 0                                                                                 | 19                                                                                | 0                                                                                   | 1502                                                                                | 528                                                                                 | 0                                                                                   | 767                                                                                 | 213                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 16                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 150                                                                               | 0                                                                                   |                                                                                     | 215                                                                                 | 0                                                                                   |                                                                                     | 200                                                                                 |
| Storage Lanes           | 0                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                 |                                                                                   | 1                                                                                 | 0                                                                                   |                                                                                     | 1                                                                                   | 0                                                                                   |                                                                                     | 1                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 100                                                                               | 150                                                                                 |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 270                                                                               |                                                                                   |                                                                                   | 465                                                                               |                                                                                   |                                                                                     | 769                                                                                 |                                                                                     |                                                                                     | 793                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 6.1                                                                               |                                                                                   |                                                                                   | 10.6                                                                              |                                                                                   |                                                                                     | 13.1                                                                                |                                                                                     |                                                                                     | 13.5                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                | 2%                                                                                | 2%                                                                                | 12%                                                                               | 2%                                                                                | 8%                                                                                | 6%                                                                                  | 3%                                                                                  | 2%                                                                                  | 2%                                                                                  | 3%                                                                                  | 1%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 100                                                                               | 0                                                                                 | 21                                                                                | 0                                                                                   | 1633                                                                                | 574                                                                                 | 0                                                                                   | 834                                                                                 | 232                                                                                 |
| Turn Type               |                                                                                   |                                                                                   |                                                                                   | custom                                                                            |                                                                                   | custom                                                                            |                                                                                     |                                                                                     | Free                                                                                |                                                                                     |                                                                                     | Perm                                                                                |
| Protected Phases        |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        |                                                                                   |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 8                                                                                 |                                                                                     |                                                                                     | Free                                                                                |                                                                                     |                                                                                     | 2                                                                                   |
| Detector Phase          |                                                                                   |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 8                                                                                 |                                                                                     | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   | 2                                                                                   |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     |                                                                                   |                                                                                   |                                                                                   | 5.0                                                                               |                                                                                   | 5.0                                                                               |                                                                                     | 10.0                                                                                |                                                                                     |                                                                                     | 10.0                                                                                | 10.0                                                                                |
| Minimum Split (s)       |                                                                                   |                                                                                   |                                                                                   | 20.0                                                                              |                                                                                   | 20.0                                                                              |                                                                                     | 20.0                                                                                |                                                                                     |                                                                                     | 22.4                                                                                | 22.4                                                                                |
| Total Split (s)         | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 22.0                                                                              | 0.0                                                                               | 22.0                                                                              | 0.0                                                                                 | 78.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 78.0                                                                                | 78.0                                                                                |
| Total Split (%)         | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                              | 22.0%                                                                             | 0.0%                                                                              | 22.0%                                                                             | 0.0%                                                                                | 78.0%                                                                               | 0.0%                                                                                | 0.0%                                                                                | 78.0%                                                                               | 78.0%                                                                               |
| Yellow Time (s)         |                                                                                   |                                                                                   |                                                                                   | 3.2                                                                               |                                                                                   | 3.2                                                                               |                                                                                     | 3.9                                                                                 |                                                                                     |                                                                                     | 3.9                                                                                 | 3.9                                                                                 |
| All-Red Time (s)        |                                                                                   |                                                                                   |                                                                                   | 2.0                                                                               |                                                                                   | 2.0                                                                               |                                                                                     | 1.5                                                                                 |                                                                                     |                                                                                     | 1.5                                                                                 | 1.5                                                                                 |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 5.2                                                                               | 4.0                                                                               | 5.2                                                                               | 4.0                                                                                 | 5.4                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 5.4                                                                                 | 5.4                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Recall Mode             |                                                                                   |                                                                                   |                                                                                   | None                                                                              |                                                                                   | None                                                                              |                                                                                     | C-Min                                                                               |                                                                                     |                                                                                     | C-Min                                                                               | C-Min                                                                               |
| Act Effect Green (s)    |                                                                                   |                                                                                   |                                                                                   | 9.8                                                                               |                                                                                   | 9.8                                                                               |                                                                                     | 82.8                                                                                | 100.0                                                                               |                                                                                     | 82.8                                                                                | 82.8                                                                                |
| Actuated g/C Ratio      |                                                                                   |                                                                                   |                                                                                   | 0.10                                                                              |                                                                                   | 0.10                                                                              |                                                                                     | 0.83                                                                                | 1.00                                                                                |                                                                                     | 0.83                                                                                | 0.83                                                                                |
| v/c Ratio               |                                                                                   |                                                                                   |                                                                                   | 0.56                                                                              |                                                                                   | 0.13                                                                              |                                                                                     | 0.56                                                                                | 0.36                                                                                |                                                                                     | 0.29                                                                                | 0.17                                                                                |
| Control Delay           |                                                                                   |                                                                                   |                                                                                   | 54.1                                                                              |                                                                                   | 17.3                                                                              |                                                                                     | 4.1                                                                                 | 0.5                                                                                 |                                                                                     | 3.5                                                                                 | 1.5                                                                                 |
| Queue Delay             |                                                                                   |                                                                                   |                                                                                   | 0.0                                                                               |                                                                                   | 0.0                                                                               |                                                                                     | 0.1                                                                                 | 0.0                                                                                 |                                                                                     | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             |                                                                                   |                                                                                   |                                                                                   | 54.1                                                                              |                                                                                   | 17.3                                                                              |                                                                                     | 4.2                                                                                 | 0.5                                                                                 |                                                                                     | 3.5                                                                                 | 1.5                                                                                 |
| LOS                     |                                                                                   |                                                                                   |                                                                                   | D                                                                                 |                                                                                   | B                                                                                 |                                                                                     | A                                                                                   | A                                                                                   |                                                                                     | A                                                                                   | A                                                                                   |
| Approach Delay          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 3.2                                                                                 |                                                                                     |                                                                                     | 3.0                                                                                 |                                                                                     |
| Approach LOS            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     | A                                                                                   |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |
| Queue Length 50th (ft)  |                                                                                   |                                                                                   |                                                                                   | 62                                                                                |                                                                                   | 0                                                                                 |                                                                                     | 192                                                                                 | 0                                                                                   |                                                                                     | 94                                                                                  | 12                                                                                  |
| Queue Length 95th (ft)  |                                                                                   |                                                                                   |                                                                                   | 110                                                                               |                                                                                   | 22                                                                                |                                                                                     | 204                                                                                 | 0                                                                                   |                                                                                     | m118                                                                                | m28                                                                                 |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 190                                                                               |                                                                                   |                                                                                   | 385                                                                               |                                                                                   |                                                                                    | 689                                                                                 |                                                                                     |                                                                                     | 713                                                                                 |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 150                                                                               |                                                                                    |                                                                                     | 215                                                                                 |                                                                                     |                                                                                     | 200                                                                                 |
| Base Capacity (vph)     |                                                                                   |                                                                                   |                                                                                   | 307                                                                               |                                                                                   | 269                                                                               |                                                                                    | 2903                                                                                | 1583                                                                                |                                                                                     | 2903                                                                                | 1364                                                                                |
| Starvation Cap Reductn  |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                    | 223                                                                                 | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                    | 238                                                                                 | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                    | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       |                                                                                   |                                                                                   |                                                                                   | 0.33                                                                              |                                                                                   | 0.08                                                                              |                                                                                    | 0.61                                                                                | 0.36                                                                                |                                                                                     | 0.29                                                                                | 0.17                                                                                |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 6 (6%), Referenced to phase 2:SBT and 6:NBT, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.56

Intersection Signal Delay: 4.8

Intersection LOS: A

Intersection Capacity Utilization 54.5%

ICU Level of Service A

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: North Ramp & Centennial Rd



|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |                                                                                   |  |  |  |  |                                                                                   |  |  |                                                                                     |  |  |                                                                                     |
| Volume (vph)            | 24                                                                                | 4                                                                                 | 149                                                                               | 206                                                                               | 2                                                                                 | 131                                                                               | 235                                                                                 | 1866                                                                                | 338                                                                                 | 80                                                                                  | 853                                                                                 | 24                                                                                  |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 0                                                                                 |                                                                                   | 200                                                                               | 200                                                                               |                                                                                   | 200                                                                               | 530                                                                                 |                                                                                     | 0                                                                                   | 215                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 0                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                   |                                                                                     | 0                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                  |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 681                                                                               |                                                                                   |                                                                                   | 921                                                                               |                                                                                   |                                                                                     | 793                                                                                 |                                                                                     |                                                                                     | 1295                                                                                |                                                                                     |
| Travel Time (s)         |                                                                                   | 15.5                                                                              |                                                                                   |                                                                                   | 20.9                                                                              |                                                                                   |                                                                                     | 13.5                                                                                |                                                                                     |                                                                                     | 22.1                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 0                                                                                 | 30                                                                                | 162                                                                               | 224                                                                               | 144                                                                               | 0                                                                                 | 255                                                                                 | 2395                                                                                | 0                                                                                   | 87                                                                                  | 953                                                                                 | 0                                                                                   |
| Turn Type               | Perm                                                                              |                                                                                   | Perm                                                                              | Perm                                                                              |                                                                                   |                                                                                   | pm+pt                                                                               |                                                                                     |                                                                                     | pm+pt                                                                               |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 | 8                                                                                 |                                                                                   |                                                                                   | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 | 4                                                                                 | 4                                                                                 | 8                                                                                 | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               |                                                                                   | 5.0                                                                                 | 4.0                                                                                 |                                                                                     | 5.0                                                                                 | 4.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              |                                                                                   | 9.0                                                                                 | 20.0                                                                                |                                                                                     | 9.0                                                                                 | 20.0                                                                                |                                                                                     |
| Total Split (s)         | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 0.0                                                                               | 20.0                                                                                | 68.0                                                                                | 0.0                                                                                 | 12.0                                                                                | 60.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 20.0%                                                                             | 20.0%                                                                             | 20.0%                                                                             | 20.0%                                                                             | 20.0%                                                                             | 0.0%                                                                              | 20.0%                                                                               | 68.0%                                                                               | 0.0%                                                                                | 12.0%                                                                               | 60.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               |                                                                                   | 3.5                                                                                 | 3.5                                                                                 |                                                                                     | 3.5                                                                                 | 3.5                                                                                 |                                                                                     |
| All-Red Time (s)        | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               |                                                                                   | 0.5                                                                                 | 0.5                                                                                 |                                                                                     | 0.5                                                                                 | 0.5                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lead                                                                                | Lead                                                                                |                                                                                     | Lag                                                                                 | Lag                                                                                 |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                                 | Yes                                                                                 |                                                                                     | Yes                                                                                 | Yes                                                                                 |                                                                                     |
| Recall Mode             | None                                                                              | None                                                                              | None                                                                              | None                                                                              | None                                                                              |                                                                                   | None                                                                                | C-Min                                                                               |                                                                                     | None                                                                                | C-Min                                                                               |                                                                                     |
| Act Effect Green (s)    |                                                                                   | 17.6                                                                              | 17.6                                                                              | 17.6                                                                              | 17.6                                                                              |                                                                                   | 65.1                                                                                | 65.1                                                                                |                                                                                     | 59.9                                                                                | 58.8                                                                                |                                                                                     |
| Actuated g/C Ratio      |                                                                                   | 0.18                                                                              | 0.18                                                                              | 0.18                                                                              | 0.18                                                                              |                                                                                   | 0.65                                                                                | 0.65                                                                                |                                                                                     | 0.60                                                                                | 0.59                                                                                |                                                                                     |
| v/c Ratio               |                                                                                   | 0.12                                                                              | 0.39                                                                              | 0.93                                                                              | 0.36                                                                              |                                                                                   | 0.62                                                                                | 1.06                                                                                |                                                                                     | 0.43                                                                                | 0.46                                                                                |                                                                                     |
| Control Delay           |                                                                                   | 37.6                                                                              | 9.2                                                                               | 85.2                                                                              | 9.8                                                                               |                                                                                   | 12.5                                                                                | 52.0                                                                                |                                                                                     | 20.7                                                                                | 7.3                                                                                 |                                                                                     |
| Queue Delay             |                                                                                   | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                                 | 0.0                                                                                 |                                                                                     | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |
| Total Delay             |                                                                                   | 37.6                                                                              | 9.2                                                                               | 85.2                                                                              | 9.8                                                                               |                                                                                   | 12.5                                                                                | 52.0                                                                                |                                                                                     | 20.7                                                                                | 7.3                                                                                 |                                                                                     |
| LOS                     |                                                                                   | D                                                                                 | A                                                                                 | F                                                                                 | A                                                                                 |                                                                                   | B                                                                                   | D                                                                                   |                                                                                     | C                                                                                   | A                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 13.6                                                                              |                                                                                   |                                                                                   | 55.7                                                                              |                                                                                   |                                                                                     | 48.2                                                                                |                                                                                     |                                                                                     | 8.4                                                                                 |                                                                                     |
| Approach LOS            |                                                                                   | B                                                                                 |                                                                                   |                                                                                   | E                                                                                 |                                                                                   |                                                                                     | D                                                                                   |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |
| Queue Length 50th (ft)  |                                                                                   | 17                                                                                | 0                                                                                 | ~148                                                                              | 2                                                                                 |                                                                                   | 31                                                                                  | ~906                                                                                |                                                                                     | 14                                                                                  | 83                                                                                  |                                                                                     |
| Queue Length 95th (ft)  |                                                                                   | 44                                                                                | 56                                                                                | #300                                                                              | 55                                                                                |                                                                                   | 69                                                                                  | #1029                                                                               |                                                                                     | 35                                                                                  | 88                                                                                  |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 601                                                                               |                                                                                   |                                                                                   | 841                                                                               |                                                                                   |                                                                                    | 713                                                                                 |                                                                                     |                                                                                     | 1215                                                                                |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   | 200                                                                               | 200                                                                               |                                                                                   |                                                                                   | 530                                                                                |                                                                                     |                                                                                     | 215                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     |                                                                                   | 245                                                                               | 411                                                                               | 242                                                                               | 395                                                                               |                                                                                   | 474                                                                                | 2265                                                                                |                                                                                     | 216                                                                                 | 2074                                                                                |                                                                                     |
| Starvation Cap Reductn  |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       |                                                                                   | 0.12                                                                              | 0.39                                                                              | 0.93                                                                              | 0.36                                                                              |                                                                                   | 0.54                                                                               | 1.06                                                                                |                                                                                     | 0.40                                                                                | 0.46                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 36 (36%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 110

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.06

Intersection Signal Delay: 37.5

Intersection LOS: D

Intersection Capacity Utilization 94.9%

ICU Level of Service F

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 4: Trenton Dr & Centennial Rd



|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |  |  |  |  |  |  |                                                                                     |  |  |  |
| Volume (vph)            | 98                                                                                | 300                                                                               | 253                                                                               | 238                                                                               | 191                                                                               | 47                                                                                | 243                                                                                 | 771                                                                                 | 331                                                                                 | 70                                                                                  | 483                                                                                 | 60                                                                                  |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                                 |                                                                                     | 0                                                                                   | 215                                                                                 |                                                                                     | 215                                                                                 |
| Storage Lanes           | 1                                                                                 |                                                                                   | 1                                                                                 | 2                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                   |                                                                                     | 0                                                                                   | 1                                                                                   |                                                                                     | 1                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                  |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 35                                                                                |                                                                                   |                                                                                   | 35                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 682                                                                               |                                                                                   |                                                                                   | 662                                                                               |                                                                                   |                                                                                     | 1295                                                                                |                                                                                     |                                                                                     | 520                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 13.3                                                                              |                                                                                   |                                                                                   | 12.9                                                                              |                                                                                   |                                                                                     | 22.1                                                                                |                                                                                     |                                                                                     | 8.9                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 107                                                                               | 326                                                                               | 275                                                                               | 259                                                                               | 208                                                                               | 51                                                                                | 264                                                                                 | 1198                                                                                | 0                                                                                   | 76                                                                                  | 525                                                                                 | 65                                                                                  |
| Turn Type               | pm+pt                                                                             |                                                                                   | Perm                                                                              | pm+pt                                                                             |                                                                                   | Perm                                                                              | pm+pt                                                                               |                                                                                     |                                                                                     | pm+pt                                                                               |                                                                                     | Perm                                                                                |
| Protected Phases        | 7                                                                                 | 4                                                                                 |                                                                                   | 3                                                                                 | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     | 2                                                                                   |
| Detector Phase          | 7                                                                                 | 4                                                                                 | 4                                                                                 | 3                                                                                 | 8                                                                                 | 8                                                                                 | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   | 2                                                                                   |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 4.0                                                                               | 10.0                                                                              | 10.0                                                                              | 4.0                                                                               | 10.0                                                                              | 10.0                                                                              | 4.0                                                                                 | 6.0                                                                                 |                                                                                     | 4.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 |
| Minimum Split (s)       | 8.0                                                                               | 15.7                                                                              | 15.7                                                                              | 8.0                                                                               | 15.7                                                                              | 15.7                                                                              | 8.0                                                                                 | 11.5                                                                                |                                                                                     | 8.0                                                                                 | 11.5                                                                                | 11.5                                                                                |
| Total Split (s)         | 12.0                                                                              | 24.0                                                                              | 24.0                                                                              | 12.0                                                                              | 24.0                                                                              | 24.0                                                                              | 17.0                                                                                | 52.0                                                                                | 0.0                                                                                 | 12.0                                                                                | 47.0                                                                                | 47.0                                                                                |
| Total Split (%)         | 12.0%                                                                             | 24.0%                                                                             | 24.0%                                                                             | 12.0%                                                                             | 24.0%                                                                             | 24.0%                                                                             | 17.0%                                                                               | 52.0%                                                                               | 0.0%                                                                                | 12.0%                                                                               | 47.0%                                                                               | 47.0%                                                                               |
| Yellow Time (s)         | 3.5                                                                               | 3.9                                                                               | 3.9                                                                               | 3.5                                                                               | 3.9                                                                               | 3.9                                                                               | 3.5                                                                                 | 3.6                                                                                 |                                                                                     | 3.5                                                                                 | 3.6                                                                                 | 3.6                                                                                 |
| All-Red Time (s)        | 0.5                                                                               | 1.8                                                                               | 1.8                                                                               | 0.5                                                                               | 1.8                                                                               | 1.8                                                                               | 0.5                                                                                 | 1.9                                                                                 |                                                                                     | 0.5                                                                                 | 1.9                                                                                 | 1.9                                                                                 |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 5.7                                                                               | 5.7                                                                               | 4.0                                                                               | 5.7                                                                               | 5.7                                                                               | 4.0                                                                                 | 5.5                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 5.5                                                                                 | 5.5                                                                                 |
| Lead/Lag                | Lag                                                                               | Lead                                                                              | Lead                                                                              | Lag                                                                               | Lead                                                                              | Lead                                                                              | Lag                                                                                 | Lead                                                                                |                                                                                     | Lag                                                                                 | Lead                                                                                | Lead                                                                                |
| Lead-Lag Optimize?      | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                                 | Yes                                                                                 |                                                                                     | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 |
| Recall Mode             | None                                                                              | Max                                                                               | Max                                                                               | None                                                                              | Max                                                                               | Max                                                                               | None                                                                                | C-Max                                                                               |                                                                                     | None                                                                                | C-Max                                                                               | C-Max                                                                               |
| Act Effect Green (s)    | 25.9                                                                              | 18.3                                                                              | 18.3                                                                              | 25.9                                                                              | 18.3                                                                              | 18.3                                                                              | 62.1                                                                                | 52.2                                                                                |                                                                                     | 54.1                                                                                | 46.3                                                                                | 46.3                                                                                |
| Actuated g/C Ratio      | 0.26                                                                              | 0.18                                                                              | 0.18                                                                              | 0.26                                                                              | 0.18                                                                              | 0.18                                                                              | 0.62                                                                                | 0.52                                                                                |                                                                                     | 0.54                                                                                | 0.46                                                                                | 0.46                                                                                |
| v/c Ratio               | 0.32                                                                              | 0.50                                                                              | 0.54                                                                              | 0.48                                                                              | 0.32                                                                              | 0.15                                                                              | 0.45                                                                                | 0.66                                                                                |                                                                                     | 0.34                                                                                | 0.32                                                                                | 0.08                                                                                |
| Control Delay           | 30.3                                                                              | 39.9                                                                              | 8.7                                                                               | 32.7                                                                              | 37.1                                                                              | 11.2                                                                              | 6.7                                                                                 | 4.6                                                                                 |                                                                                     | 18.4                                                                                | 18.1                                                                                | 4.6                                                                                 |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 |                                                                                     | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             | 30.3                                                                              | 39.9                                                                              | 8.7                                                                               | 32.7                                                                              | 37.1                                                                              | 11.2                                                                              | 6.7                                                                                 | 4.6                                                                                 |                                                                                     | 18.4                                                                                | 18.1                                                                                | 4.6                                                                                 |
| LOS                     | C                                                                                 | D                                                                                 | A                                                                                 | C                                                                                 | D                                                                                 | B                                                                                 | A                                                                                   | A                                                                                   |                                                                                     | B                                                                                   | B                                                                                   | A                                                                                   |
| Approach Delay          |                                                                                   | 26.3                                                                              |                                                                                   |                                                                                   | 32.3                                                                              |                                                                                   |                                                                                     | 5.0                                                                                 |                                                                                     |                                                                                     | 16.8                                                                                |                                                                                     |
| Approach LOS            |                                                                                   | C                                                                                 |                                                                                   |                                                                                   | C                                                                                 |                                                                                   |                                                                                     | A                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 51                                                                                | 99                                                                                | 0                                                                                 | 64                                                                                | 61                                                                                | 0                                                                                 | 34                                                                                  | 111                                                                                 |                                                                                     | 18                                                                                  | 108                                                                                 | 0                                                                                   |
| Queue Length 95th (ft)  | 93                                                                                | 144                                                                               | 69                                                                                | 95                                                                                | 95                                                                                | 32                                                                                | m47                                                                                 | m147                                                                                |                                                                                     | 36                                                                                  | 155                                                                                 | 24                                                                                  |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 602                                                                               |                                                                                   |                                                                                   | 582                                                                               |                                                                                   |                                                                                    | 1215                                                                                |                                                                                     |                                                                                     | 440                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                                |                                                                                     |                                                                                     | 215                                                                                 |                                                                                     | 215                                                                                 |
| Base Capacity (vph)     | 373                                                                               | 648                                                                               | 514                                                                               | 612                                                                               | 648                                                                               | 331                                                                               | 634                                                                                | 1807                                                                                |                                                                                     | 256                                                                                 | 1639                                                                                | 768                                                                                 |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       | 0.29                                                                              | 0.50                                                                              | 0.54                                                                              | 0.42                                                                              | 0.32                                                                              | 0.15                                                                              | 0.42                                                                               | 0.66                                                                                |                                                                                     | 0.30                                                                                | 0.32                                                                                | 0.08                                                                                |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 56 (56%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.66

Intersection Signal Delay: 16.1

Intersection LOS: B

Intersection Capacity Utilization 66.9%

ICU Level of Service C

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: Century Ave & Centennial Rd

|                                                                                        |                                                                                        |                                                                                          |                                                                                          |
|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
|  ø2  |  ø1  |  ø4  |  ø3  |
| 47 s                                                                                   | 17 s                                                                                   | 24 s                                                                                     | 12 s                                                                                     |
|  ø6 |  ø5 |  ø8 |  ø7 |
| 52 s                                                                                   | 12 s                                                                                   | 24 s                                                                                     | 12 s                                                                                     |



## **Appendix X: 2059 – Existing Conditions AM (4A1)**

Exit 161 Operational Study  
Bismarck, ND

1: Divide Ave & Bismarck Expy

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |                                                                                   |  |  |  |  |  |  |  |  |  |
| Volume (vph)            | 161                                                                               | 173                                                                               | 25                                                                                | 267                                                                               | 182                                                                               | 623                                                                               | 34                                                                                  | 578                                                                                 | 97                                                                                  | 462                                                                                 | 1584                                                                                | 353                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 150                                                                               |                                                                                   | 0                                                                                 | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                 |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                   |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 100                                                                               |                                                                                   | 25                                                                                | 100                                                                               |                                                                                   | 100                                                                               | 100                                                                                 |                                                                                     | 150                                                                                 | 100                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 25                                                                                |                                                                                   |                                                                                   | 25                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 371                                                                               |                                                                                   |                                                                                   | 341                                                                               |                                                                                   |                                                                                     | 614                                                                                 |                                                                                     |                                                                                     | 458                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 10.1                                                                              |                                                                                   |                                                                                   | 9.3                                                                               |                                                                                   |                                                                                     | 10.5                                                                                |                                                                                     |                                                                                     | 7.8                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 4%                                                                                | 1%                                                                                | 1%                                                                                | 11%                                                                               | 10%                                                                               | 22%                                                                               | 10%                                                                                 | 7%                                                                                  | 17%                                                                                 | 11%                                                                                 | 4%                                                                                  | 4%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 175                                                                               | 215                                                                               | 0                                                                                 | 290                                                                               | 198                                                                               | 677                                                                               | 37                                                                                  | 628                                                                                 | 105                                                                                 | 502                                                                                 | 2106                                                                                | 0                                                                                   |
| Turn Type               | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                              |                                                                                   | pm+ov                                                                             | Perm                                                                                |                                                                                     | Perm                                                                                | pm+pt                                                                               |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 | 5                                                                                 |                                                                                     | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                   |                                                                                     | 6                                                                                   | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 | 4                                                                                 |                                                                                   | 8                                                                                 | 8                                                                                 | 5                                                                                 | 6                                                                                   | 6                                                                                   | 6                                                                                   | 5                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               | 6.0                                                                               |                                                                                   | 6.0                                                                               | 6.0                                                                               | 5.0                                                                               | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 5.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 30.0                                                                              | 30.0                                                                              |                                                                                   | 30.0                                                                              | 30.0                                                                              | 9.8                                                                               | 22.9                                                                                | 22.9                                                                                | 22.9                                                                                | 9.8                                                                                 | 28.7                                                                                |                                                                                     |
| Total Split (s)         | 34.0                                                                              | 34.0                                                                              | 0.0                                                                               | 34.0                                                                              | 34.0                                                                              | 35.4                                                                              | 30.6                                                                                | 30.6                                                                                | 30.6                                                                                | 35.4                                                                                | 66.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 34.0%                                                                             | 34.0%                                                                             | 0.0%                                                                              | 34.0%                                                                             | 34.0%                                                                             | 35.4%                                                                             | 30.6%                                                                               | 30.6%                                                                               | 30.6%                                                                               | 35.4%                                                                               | 66.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 3.0                                                                               | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 | 3.0                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 1.0                                                                               | 1.8                                                                                 | 1.8                                                                                 | 1.8                                                                                 | 1.0                                                                                 | 1.8                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 5.7                                                                                 | 5.7                                                                                 | 5.7                                                                                 | 4.0                                                                                 | 5.7                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lead                                                                              | Lag                                                                                 | Lag                                                                                 | Lag                                                                                 | Lead                                                                                |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                               | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 |                                                                                     |                                                                                     |
| Recall Mode             | None                                                                              | None                                                                              |                                                                                   | None                                                                              | None                                                                              | None                                                                              | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               | None                                                                                | C-Min                                                                               |                                                                                     |
| Act Effect Green (s)    | 28.0                                                                              | 28.0                                                                              |                                                                                   | 28.0                                                                              | 28.0                                                                              | 61.3                                                                              | 29.0                                                                                | 29.0                                                                                | 29.0                                                                                | 62.0                                                                                | 60.3                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.28                                                                              | 0.28                                                                              |                                                                                   | 0.28                                                                              | 0.28                                                                              | 0.61                                                                              | 0.29                                                                                | 0.29                                                                                | 0.29                                                                                | 0.62                                                                                | 0.60                                                                                |                                                                                     |
| v/c Ratio               | 0.60                                                                              | 0.41                                                                              |                                                                                   | 1.12                                                                              | 0.41                                                                              | 0.82                                                                              | 0.54                                                                                | 0.64                                                                                | 0.22                                                                                | 0.86                                                                                | 1.02                                                                                |                                                                                     |
| Control Delay           | 41.3                                                                              | 31.2                                                                              |                                                                                   | 127.6                                                                             | 32.4                                                                              | 23.2                                                                              | 65.0                                                                                | 35.8                                                                                | 7.4                                                                                 | 28.3                                                                                | 37.1                                                                                |                                                                                     |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 36.7                                                                                |                                                                                     |
| Total Delay             | 41.3                                                                              | 31.2                                                                              |                                                                                   | 127.6                                                                             | 32.4                                                                              | 23.2                                                                              | 65.0                                                                                | 35.8                                                                                | 7.4                                                                                 | 28.3                                                                                | 73.8                                                                                |                                                                                     |
| LOS                     | D                                                                                 | C                                                                                 |                                                                                   | F                                                                                 | C                                                                                 | C                                                                                 | E                                                                                   | D                                                                                   | A                                                                                   | C                                                                                   | E                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 35.7                                                                              |                                                                                   |                                                                                   | 50.7                                                                              |                                                                                   |                                                                                     | 33.3                                                                                |                                                                                     |                                                                                     | 65.0                                                                                |                                                                                     |
| Approach LOS            |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | D                                                                                 |                                                                                   |                                                                                     | C                                                                                   |                                                                                     |                                                                                     | E                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 97                                                                                | 108                                                                               |                                                                                   | ~214                                                                              | 103                                                                               | 263                                                                               | 21                                                                                  | 193                                                                                 | 0                                                                                   | 205                                                                                 | ~606                                                                                |                                                                                     |
| Queue Length 95th (ft)  | 172                                                                               | 176                                                                               |                                                                                   | #377                                                                              | 168                                                                               | 435                                                                               | #77                                                                                 | 259                                                                                 | 41                                                                                  | m258                                                                                | #885                                                                                |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 291                                                                               |                                                                                   |                                                                                   | 261                                                                               |                                                                                   |                                                                                     | 534                                                                                 |                                                                                     |                                                                                     | 378                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 150                                                                               |                                                                                   |                                                                                   | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                 |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 291                                                                               | 522                                                                               |                                                                                   | 259                                                                               | 484                                                                               | 878                                                                               | 69                                                                                  | 978                                                                                 | 474                                                                                 | 634                                                                                 | 2055                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 167                                                                                 |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.60                                                                              | 0.41                                                                              |                                                                                   | 1.12                                                                              | 0.41                                                                              | 0.77                                                                              | 0.54                                                                                | 0.64                                                                                | 0.22                                                                                | 0.79                                                                                | 1.12                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 24 (24%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 110

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.12

Intersection Signal Delay: 54.4

Intersection LOS: D

Intersection Capacity Utilization 105.0%

ICU Level of Service G

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Divide Ave & Bismarck Expy



|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |                                                                                   |  |                                                                                   |                                                                                   |                                                                                   |                                                                                    |  |  |  |  |  |
| Volume (vph)            | 188                                                                               | 0                                                                                 | 764                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 926                                                                                 | 135                                                                                 | 39                                                                                  | 1528                                                                                | 0                                                                                   |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                 | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 200                                                                               |                                                                                   | 200                                                                               | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  |                                                                                     | 0                                                                                   | 222                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 2                                                                                 |                                                                                   | 2                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 300                                                                               | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                 |                                                                                     | 25                                                                                  | 150                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                    |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                    | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 575                                                                               |                                                                                   |                                                                                   | 383                                                                               |                                                                                   |                                                                                    | 458                                                                                 |                                                                                     |                                                                                     | 769                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 13.1                                                                              |                                                                                   |                                                                                   | 8.7                                                                               |                                                                                   |                                                                                    | 7.8                                                                                 |                                                                                     |                                                                                     | 13.1                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                               | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                               | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 3%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                 | 8%                                                                                  | 27%                                                                                 | 10%                                                                                 | 9%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 204                                                                               | 0                                                                                 | 830                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 1007                                                                                | 147                                                                                 | 42                                                                                  | 1661                                                                                | 0                                                                                   |
| Turn Type               | custom                                                                            |                                                                                   | custom                                                                            |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     | Perm                                                                                | Perm                                                                                |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     | 6                                                                                   | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                   | 6                                                                                   | 2                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               |                                                                                   | 6.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 21.1                                                                              |                                                                                   | 21.1                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 23.4                                                                                | 23.4                                                                                | 21.4                                                                                | 21.4                                                                                |                                                                                     |
| Total Split (s)         | 37.9                                                                              | 0.0                                                                               | 37.9                                                                              | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 62.1                                                                                | 62.1                                                                                | 62.1                                                                                | 62.1                                                                                | 0.0                                                                                 |
| Total Split (%)         | 37.9%                                                                             | 0.0%                                                                              | 37.9%                                                                             | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                               | 62.1%                                                                               | 62.1%                                                                               | 62.1%                                                                               | 62.1%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.6                                                                               |                                                                                   | 3.6                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 1.5                                                                               |                                                                                   | 1.5                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 1.5                                                                                 | 1.5                                                                                 | 1.5                                                                                 | 1.5                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 5.1                                                                               | 4.0                                                                               | 5.1                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                                | 5.4                                                                                 | 5.4                                                                                 | 5.4                                                                                 | 5.4                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Recall Mode             | None                                                                              |                                                                                   | None                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               |                                                                                     |
| Act Effct Green (s)     | 31.6                                                                              |                                                                                   | 31.6                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 57.9                                                                                | 57.9                                                                                | 57.9                                                                                | 57.9                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.32                                                                              |                                                                                   | 0.32                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.58                                                                                | 0.58                                                                                | 0.58                                                                                | 0.58                                                                                |                                                                                     |
| v/c Ratio               | 0.19                                                                              |                                                                                   | 0.92                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.52                                                                                | 0.18                                                                                | 0.19                                                                                | 0.87                                                                                |                                                                                     |
| Control Delay           | 25.1                                                                              |                                                                                   | 47.6                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 13.3                                                                                | 3.1                                                                                 | 3.2                                                                                 | 9.2                                                                                 |                                                                                     |
| Queue Delay             | 0.0                                                                               |                                                                                   | 4.5                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.2                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 19.7                                                                                |                                                                                     |
| Total Delay             | 25.1                                                                              |                                                                                   | 52.1                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 13.5                                                                                | 3.1                                                                                 | 3.2                                                                                 | 29.0                                                                                |                                                                                     |
| LOS                     | C                                                                                 |                                                                                   | D                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | B                                                                                   | A                                                                                   | A                                                                                   | C                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 12.1                                                                                |                                                                                     |                                                                                     | 28.3                                                                                |                                                                                     |
| Approach LOS            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | B                                                                                   |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 47                                                                                |                                                                                   | 272                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 177                                                                                 | 9                                                                                   | 4                                                                                   | 428                                                                                 |                                                                                     |
| Queue Length 95th (ft)  | 75                                                                                |                                                                                   | #396                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 194                                                                                 | m15                                                                                 | m4                                                                                  | m226                                                                                |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 495                                                                               |                                                                                   |                                                                                   | 303                                                                               |                                                                                   |                                                                                    | 378                                                                                 |                                                                                     |                                                                                     | 689                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 200                                                                               |                                                                                   | 200                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | 222                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 1115                                                                              |                                                                                   | 938                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 1937                                                                                | 799                                                                                 | 226                                                                                 | 1919                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 259                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 |                                                                                   | 65                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 309                                                                                 |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.18                                                                              |                                                                                   | 0.95                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.60                                                                                | 0.18                                                                                | 0.19                                                                                | 1.03                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:SBTL and 6:NBT, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.92

Intersection Signal Delay: 28.4

Intersection LOS: C

Intersection Capacity Utilization 106.4%

ICU Level of Service G

Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: South Ramp & Centennial Rd

|                                                                                     |                                                                                      |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
|  |  |
| ø2                                                                                  | ø4                                                                                   |
| 62.1 s                                                                              | 37.9 s                                                                               |
|  |                                                                                      |
| ø6                                                                                  |                                                                                      |
| 62.1 s                                                                              |                                                                                      |

| Lane Group              | EBL  | EBT  | EBR  | WBL    | WBT  | WBR    | NBL   | NBT   | NBR  | SBL  | SBT   | SBR   |
|-------------------------|------|------|------|--------|------|--------|-------|-------|------|------|-------|-------|
| Lane Configurations     |      |      |      |        |      |        |       |       |      |      |       |       |
| Volume (vph)            | 0    | 0    | 0    | 193    | 0    | 19     | 447   | 573   | 0    | 0    | 2128  | 475   |
| Ideal Flow (vphpl)      | 1900 | 1900 | 1900 | 1900   | 1900 | 1900   | 1900  | 1900  | 1900 | 1900 | 1900  | 1900  |
| Lane Width (ft)         | 12   | 12   | 12   | 16     | 12   | 12     | 12    | 12    | 12   | 12   | 12    | 12    |
| Grade (%)               |      | 0%   |      |        | 0%   |        |       | 0%    |      |      | 0%    |       |
| Storage Length (ft)     | 0    |      | 0    | 0      |      | 150    | 215   |       | 0    | 0    |       | 200   |
| Storage Lanes           | 0    |      | 0    | 1      |      | 1      | 1     |       | 0    | 0    |       | 1     |
| Taper Length (ft)       | 25   |      | 25   | 25     |      | 100    | 150   |       | 25   | 25   |       | 25    |
| Right Turn on Red       |      |      | Yes  |        |      | Yes    |       |       | Yes  |      |       | Yes   |
| Link Speed (mph)        |      | 30   |      |        | 30   |        |       | 40    |      |      | 40    |       |
| Link Distance (ft)      |      | 270  |      |        | 465  |        |       | 769   |      |      | 786   |       |
| Travel Time (s)         |      | 6.1  |      |        | 10.6 |        |       | 13.1  |      |      | 13.4  |       |
| Confl. Peds. (#/hr)     |      |      |      |        |      |        |       |       |      |      |       |       |
| Confl. Bikes (#/hr)     |      |      |      |        |      |        |       |       |      |      |       |       |
| Peak Hour Factor        | 0.92 | 0.92 | 0.92 | 0.92   | 0.92 | 0.92   | 0.92  | 0.92  | 0.92 | 0.92 | 0.92  | 0.92  |
| Growth Factor           | 100% | 100% | 100% | 100%   | 100% | 100%   | 100%  | 100%  | 100% | 100% | 100%  | 100%  |
| Heavy Vehicles (%)      | 2%   | 2%   | 2%   | 12%    | 2%   | 8%     | 6%    | 3%    | 2%   | 2%   | 3%    | 1%    |
| Bus Blockages (#/hr)    | 0    | 0    | 0    | 0      | 0    | 0      | 0     | 0     | 0    | 0    | 0     | 0     |
| Parking (#/hr)          |      |      |      |        |      |        |       |       |      |      |       |       |
| Mid-Block Traffic (%)   |      | 0%   |      |        | 0%   |        |       | 0%    |      |      | 0%    |       |
| Shared Lane Traffic (%) |      |      |      |        |      |        |       |       |      |      |       |       |
| Lane Group Flow (vph)   | 0    | 0    | 0    | 210    | 0    | 21     | 486   | 623   | 0    | 0    | 2313  | 516   |
| Turn Type               |      |      |      | custom |      | custom | pm+pt |       |      |      |       | Perm  |
| Protected Phases        |      |      |      |        |      |        | 1     | 6     |      |      | 2     |       |
| Permitted Phases        |      |      |      | 8      |      | 8      | 6     |       |      |      |       | 2     |
| Detector Phase          |      |      |      | 8      |      | 8      | 1     | 6     |      |      | 2     | 2     |
| Switch Phase            |      |      |      |        |      |        |       |       |      |      |       |       |
| Minimum Initial (s)     |      |      |      | 5.0    |      | 5.0    | 5.0   | 10.0  |      |      | 10.0  | 10.0  |
| Minimum Split (s)       |      |      |      | 20.0   |      | 20.0   | 9.0   | 20.0  |      |      | 22.4  | 22.4  |
| Total Split (s)         | 0.0  | 0.0  | 0.0  | 20.0   | 0.0  | 20.0   | 20.0  | 80.0  | 0.0  | 0.0  | 60.0  | 60.0  |
| Total Split (%)         | 0.0% | 0.0% | 0.0% | 20.0%  | 0.0% | 20.0%  | 20.0% | 80.0% | 0.0% | 0.0% | 60.0% | 60.0% |
| Yellow Time (s)         |      |      |      | 3.2    |      | 3.2    | 3.0   | 3.9   |      |      | 3.9   | 3.9   |
| All-Red Time (s)        |      |      |      | 2.0    |      | 2.0    | 1.0   | 1.5   |      |      | 1.5   | 1.5   |
| Lost Time Adjust (s)    | 0.0  | 0.0  | 0.0  | 0.0    | 0.0  | 0.0    | 0.0   | 0.0   | 0.0  | 0.0  | 0.0   | 0.0   |
| Total Lost Time (s)     | 4.0  | 4.0  | 4.0  | 5.2    | 4.0  | 5.2    | 4.0   | 5.4   | 4.0  | 4.0  | 5.4   | 5.4   |
| Lead/Lag                |      |      |      |        |      |        | Lead  |       |      |      | Lag   | Lag   |
| Lead-Lag Optimize?      |      |      |      |        |      |        | Yes   |       |      |      | Yes   | Yes   |
| Recall Mode             |      |      |      | None   |      | None   | None  | C-Min |      |      | C-Min | C-Min |
| Act Effect Green (s)    |      |      |      | 13.8   |      | 13.8   | 77.0  | 75.6  |      |      | 54.6  | 54.6  |
| Actuated g/C Ratio      |      |      |      | 0.14   |      | 0.14   | 0.77  | 0.76  |      |      | 0.55  | 0.55  |
| v/c Ratio               |      |      |      | 0.83   |      | 0.09   | 1.34  | 0.24  |      |      | 1.21  | 0.51  |
| Control Delay           |      |      |      | 69.3   |      | 16.1   | 195.0 | 3.8   |      |      | 117.6 | 5.1   |
| Queue Delay             |      |      |      | 0.0    |      | 0.0    | 0.0   | 0.0   |      |      | 0.0   | 0.0   |
| Total Delay             |      |      |      | 69.3   |      | 16.1   | 195.0 | 3.8   |      |      | 117.6 | 5.1   |
| LOS                     |      |      |      | E      |      | B      | F     | A     |      |      | F     | A     |
| Approach Delay          |      |      |      |        |      |        |       | 87.6  |      |      | 97.1  |       |
| Approach LOS            |      |      |      |        |      |        |       | F     |      |      | F     |       |
| Queue Length 50th (ft)  |      |      |      | 130    |      | 0      | ~382  | 51    |      |      | ~973  | 91    |
| Queue Length 95th (ft)  |      |      |      | #244   |      | 22     | #582  | 68    |      |      | m642  | m62   |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) | 190                                                                               |                                                                                   |                                                                                   | 385                                                                               |                                                                                   |                                                                                   | 689                                                                                |                                                                                     |                                                                                     | 706                                                                                 |                                                                                     |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 150                                                                                | 215                                                                                 |                                                                                     |                                                                                     |                                                                                     | 200                                                                                 |
| Base Capacity (vph)     |                                                                                   |                                                                                   |                                                                                   | 270                                                                               |                                                                                   | 239                                                                               | 363                                                                                | 2651                                                                                |                                                                                     |                                                                                     | 1914                                                                                | 1011                                                                                |
| Starvation Cap Reductn  |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     |                                                                                     | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     |                                                                                     | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     |                                                                                     | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       |                                                                                   |                                                                                   |                                                                                   | 0.78                                                                              |                                                                                   | 0.09                                                                              | 1.34                                                                               | 0.24                                                                                |                                                                                     |                                                                                     | 1.21                                                                                | 0.51                                                                                |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 76 (76%), Referenced to phase 2:SBT and 6:NBTL, Start of Green

Natural Cycle: 150

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.34

Intersection Signal Delay: 92.8

Intersection LOS: F

Intersection Capacity Utilization 106.4%

ICU Level of Service G

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: North Ramp & Centennial Rd



|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |                                                                                   |  |  |  |  |                                                                                   |  |  |  |  |  |  |
| Volume (veh/h)                    | 14                                                                                | 2                                                                                 | 423                                                                               | 177                                                                               | 9                                                                                 | 80                                                                                | 107                                                                                 | 595                                                                                 | 140                                                                                 | 22                                                                                  | 1755                                                                                | 29                                                                                  |
| Sign Control                      |                                                                                   | Stop                                                                              |                                                                                   |                                                                                   | Stop                                                                              |                                                                                   |                                                                                     | Free                                                                                |                                                                                     |                                                                                     | Free                                                                                |                                                                                     |
| Grade                             |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Peak Hour Factor                  | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Hourly flow rate (vph)            | 15                                                                                | 2                                                                                 | 460                                                                               | 192                                                                               | 10                                                                                | 87                                                                                | 116                                                                                 | 647                                                                                 | 152                                                                                 | 24                                                                                  | 1908                                                                                | 32                                                                                  |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Width (ft)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Walking Speed (ft/s)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Right turn flare (veh)            |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Median type                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     | None                                                                                |                                                                                     |                                                                                     | None                                                                                |                                                                                     |
| Median storage (veh)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Upstream signal (ft)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 786                                                                                 |                                                                                     |                                                                                     | 1308                                                                                |                                                                                     |
| pX, platoon unblocked             | 0.61                                                                              | 0.61                                                                              | 0.60                                                                              | 0.61                                                                              | 0.61                                                                              | 1.00                                                                              | 0.60                                                                                |                                                                                     |                                                                                     | 1.00                                                                                |                                                                                     |                                                                                     |
| vC, conflicting volume            | 2619                                                                              | 3003                                                                              | 970                                                                               | 1958                                                                              | 2942                                                                              | 399                                                                               | 1939                                                                                |                                                                                     |                                                                                     | 799                                                                                 |                                                                                     |                                                                                     |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vCu, unblocked vol                | 2367                                                                              | 3001                                                                              | 0                                                                                 | 1275                                                                              | 2901                                                                              | 398                                                                               | 1246                                                                                |                                                                                     |                                                                                     | 798                                                                                 |                                                                                     |                                                                                     |
| tC, single (s)                    | 7.5                                                                               | 6.5                                                                               | 6.9                                                                               | 7.5                                                                               | 6.5                                                                               | 6.9                                                                               | 4.1                                                                                 |                                                                                     |                                                                                     | 4.1                                                                                 |                                                                                     |                                                                                     |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| tF (s)                            | 3.5                                                                               | 4.0                                                                               | 3.3                                                                               | 3.5                                                                               | 4.0                                                                               | 3.3                                                                               | 2.2                                                                                 |                                                                                     |                                                                                     | 2.2                                                                                 |                                                                                     |                                                                                     |
| p0 queue free %                   | 0                                                                                 | 58                                                                                | 30                                                                                | 0                                                                                 | 0                                                                                 | 86                                                                                | 65                                                                                  |                                                                                     |                                                                                     | 97                                                                                  |                                                                                     |                                                                                     |
| cM capacity (veh/h)               | 0                                                                                 | 5                                                                                 | 656                                                                               | 11                                                                                | 6                                                                                 | 601                                                                               | 335                                                                                 |                                                                                     |                                                                                     | 820                                                                                 |                                                                                     |                                                                                     |
| Direction, Lane #                 | EB 1                                                                              | WB 1                                                                              | WB 2                                                                              | NB 1                                                                              | NB 2                                                                              | NB 3                                                                              | SB 1                                                                                | SB 2                                                                                | SB 3                                                                                |                                                                                     |                                                                                     |                                                                                     |
| Volume Total                      | 477                                                                               | 192                                                                               | 97                                                                                | 116                                                                               | 431                                                                               | 368                                                                               | 24                                                                                  | 1272                                                                                | 667                                                                                 |                                                                                     |                                                                                     |                                                                                     |
| Volume Left                       | 15                                                                                | 192                                                                               | 0                                                                                 | 116                                                                               | 0                                                                                 | 0                                                                                 | 24                                                                                  | 0                                                                                   | 0                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Volume Right                      | 460                                                                               | 0                                                                                 | 87                                                                                | 0                                                                                 | 0                                                                                 | 152                                                                               | 0                                                                                   | 0                                                                                   | 32                                                                                  |                                                                                     |                                                                                     |                                                                                     |
| cSH                               | 3                                                                                 | 11                                                                                | 54                                                                                | 335                                                                               | 1700                                                                              | 1700                                                                              | 820                                                                                 | 1700                                                                                | 1700                                                                                |                                                                                     |                                                                                     |                                                                                     |
| Volume to Capacity                | 166.43                                                                            | 17.46                                                                             | 1.79                                                                              | 0.35                                                                              | 0.25                                                                              | 0.22                                                                              | 0.03                                                                                | 0.75                                                                                | 0.39                                                                                |                                                                                     |                                                                                     |                                                                                     |
| Queue Length 95th (ft)            | Err                                                                               | Err                                                                               | 231                                                                               | 38                                                                                | 0                                                                                 | 0                                                                                 | 2                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Control Delay (s)                 | Err                                                                               | Err                                                                               | 539.6                                                                             | 21.3                                                                              | 0.0                                                                               | 0.0                                                                               | 9.5                                                                                 | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |                                                                                     |                                                                                     |
| Lane LOS                          | F                                                                                 | F                                                                                 | F                                                                                 | C                                                                                 |                                                                                   |                                                                                   | A                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach Delay (s)                | Err                                                                               | 6834.0                                                                            |                                                                                   | 2.7                                                                               |                                                                                   |                                                                                   | 0.1                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach LOS                      | F                                                                                 | F                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Average Delay                     |                                                                                   |                                                                                   | 1852.0                                                                            |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 95.4%                                                                             |                                                                                   | ICU Level of Service                                                              |                                                                                   |                                                                                     |                                                                                     |                                                                                     | F                                                                                   |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

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| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |  |  |  |  |  |  |                                                                                     |  |  |  |
| Volume (vph)            | 47                                                                                | 64                                                                                | 415                                                                               | 1147                                                                              | 475                                                                               | 62                                                                                | 182                                                                                 | 399                                                                                 | 38                                                                                  | 44                                                                                  | 1921                                                                                | 173                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                                 |                                                                                     | 0                                                                                   | 215                                                                                 |                                                                                     | 215                                                                                 |
| Storage Lanes           | 1                                                                                 |                                                                                   | 1                                                                                 | 2                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                   |                                                                                     | 0                                                                                   | 1                                                                                   |                                                                                     | 1                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                  |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 35                                                                                |                                                                                   |                                                                                   | 35                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 548                                                                               |                                                                                   |                                                                                   | 576                                                                               |                                                                                   |                                                                                     | 1308                                                                                |                                                                                     |                                                                                     | 327                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 10.7                                                                              |                                                                                   |                                                                                   | 11.2                                                                              |                                                                                   |                                                                                     | 22.3                                                                                |                                                                                     |                                                                                     | 5.6                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 51                                                                                | 70                                                                                | 451                                                                               | 1247                                                                              | 516                                                                               | 67                                                                                | 198                                                                                 | 475                                                                                 | 0                                                                                   | 48                                                                                  | 2088                                                                                | 188                                                                                 |
| Turn Type               | pm+pt                                                                             |                                                                                   | Perm                                                                              | pm+pt                                                                             |                                                                                   | Perm                                                                              | pm+pt                                                                               |                                                                                     |                                                                                     | pm+pt                                                                               |                                                                                     | Perm                                                                                |
| Protected Phases        | 7                                                                                 | 4                                                                                 |                                                                                   | 3                                                                                 | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     | 2                                                                                   |
| Detector Phase          | 7                                                                                 | 4                                                                                 | 4                                                                                 | 3                                                                                 | 8                                                                                 | 8                                                                                 | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   | 2                                                                                   |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 4.0                                                                               | 10.0                                                                              | 10.0                                                                              | 4.0                                                                               | 10.0                                                                              | 10.0                                                                              | 4.0                                                                                 | 6.0                                                                                 |                                                                                     | 4.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 |
| Minimum Split (s)       | 8.0                                                                               | 15.7                                                                              | 15.7                                                                              | 8.0                                                                               | 15.7                                                                              | 15.7                                                                              | 8.0                                                                                 | 11.5                                                                                |                                                                                     | 8.0                                                                                 | 11.5                                                                                | 11.5                                                                                |
| Total Split (s)         | 12.0                                                                              | 23.0                                                                              | 23.0                                                                              | 22.0                                                                              | 33.0                                                                              | 33.0                                                                              | 12.0                                                                                | 43.0                                                                                | 0.0                                                                                 | 12.0                                                                                | 43.0                                                                                | 43.0                                                                                |
| Total Split (%)         | 12.0%                                                                             | 23.0%                                                                             | 23.0%                                                                             | 22.0%                                                                             | 33.0%                                                                             | 33.0%                                                                             | 12.0%                                                                               | 43.0%                                                                               | 0.0%                                                                                | 12.0%                                                                               | 43.0%                                                                               | 43.0%                                                                               |
| Yellow Time (s)         | 3.5                                                                               | 3.9                                                                               | 3.9                                                                               | 3.5                                                                               | 3.9                                                                               | 3.9                                                                               | 3.5                                                                                 | 3.6                                                                                 |                                                                                     | 3.5                                                                                 | 3.6                                                                                 | 3.6                                                                                 |
| All-Red Time (s)        | 0.5                                                                               | 1.8                                                                               | 1.8                                                                               | 0.5                                                                               | 1.8                                                                               | 1.8                                                                               | 0.5                                                                                 | 1.9                                                                                 |                                                                                     | 0.5                                                                                 | 1.9                                                                                 | 1.9                                                                                 |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 5.7                                                                               | 5.7                                                                               | 4.0                                                                               | 5.7                                                                               | 5.7                                                                               | 4.0                                                                                 | 5.5                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 5.5                                                                                 | 5.5                                                                                 |
| Lead/Lag                | Lag                                                                               | Lag                                                                               | Lag                                                                               | Lead                                                                              | Lead                                                                              | Lead                                                                              | Lead                                                                                | Lead                                                                                |                                                                                     | Lag                                                                                 | Lag                                                                                 | Lag                                                                                 |
| Lead-Lag Optimize?      | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                                 | Yes                                                                                 |                                                                                     | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 |
| Recall Mode             | None                                                                              | Max                                                                               | Max                                                                               | None                                                                              | Max                                                                               | Max                                                                               | None                                                                                | C-Max                                                                               |                                                                                     | None                                                                                | C-Max                                                                               | C-Max                                                                               |
| Act Effect Green (s)    | 19.0                                                                              | 17.3                                                                              | 17.3                                                                              | 31.4                                                                              | 29.7                                                                              | 29.7                                                                              | 43.8                                                                                | 42.3                                                                                |                                                                                     | 39.0                                                                                | 37.5                                                                                | 37.5                                                                                |
| Actuated g/C Ratio      | 0.19                                                                              | 0.17                                                                              | 0.17                                                                              | 0.31                                                                              | 0.30                                                                              | 0.30                                                                              | 0.44                                                                                | 0.42                                                                                |                                                                                     | 0.39                                                                                | 0.38                                                                                | 0.38                                                                                |
| v/c Ratio               | 0.22                                                                              | 0.11                                                                              | 1.13                                                                              | 1.48                                                                              | 0.49                                                                              | 0.13                                                                              | 0.88                                                                                | 0.32                                                                                |                                                                                     | 0.12                                                                                | 1.57                                                                                | 0.29                                                                                |
| Control Delay           | 38.3                                                                              | 35.5                                                                              | 112.4                                                                             | 248.6                                                                             | 31.7                                                                              | 7.8                                                                               | 62.0                                                                                | 22.7                                                                                |                                                                                     | 20.9                                                                                | 288.2                                                                               | 12.1                                                                                |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 |                                                                                     | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             | 38.3                                                                              | 35.5                                                                              | 112.4                                                                             | 248.6                                                                             | 31.7                                                                              | 7.8                                                                               | 62.0                                                                                | 22.7                                                                                |                                                                                     | 20.9                                                                                | 288.2                                                                               | 12.1                                                                                |
| LOS                     | D                                                                                 | D                                                                                 | F                                                                                 | F                                                                                 | C                                                                                 | A                                                                                 | E                                                                                   | C                                                                                   |                                                                                     | C                                                                                   | F                                                                                   | B                                                                                   |
| Approach Delay          |                                                                                   | 96.4                                                                              |                                                                                   |                                                                                   | 178.6                                                                             |                                                                                   |                                                                                     | 34.3                                                                                |                                                                                     |                                                                                     | 260.4                                                                               |                                                                                     |
| Approach LOS            |                                                                                   | F                                                                                 |                                                                                   |                                                                                   | F                                                                                 |                                                                                   |                                                                                     | C                                                                                   |                                                                                     |                                                                                     | F                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 27                                                                                | 20                                                                                | ~250                                                                              | ~514                                                                              | 147                                                                               | 0                                                                                 | 103                                                                                 | 130                                                                                 |                                                                                     | 19                                                                                  | ~1000                                                                               | 39                                                                                  |
| Queue Length 95th (ft)  | 61                                                                                | 40                                                                                | #446                                                                              | #643                                                                              | 200                                                                               | 32                                                                                | #215                                                                                | 176                                                                                 |                                                                                     | 42                                                                                  | #1138                                                                               | 89                                                                                  |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 468                                                                               |                                                                                   |                                                                                   | 496                                                                               |                                                                                   |                                                                                    | 1228                                                                                |                                                                                     |                                                                                     | 247                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                                |                                                                                     |                                                                                     | 215                                                                                 |                                                                                     | 215                                                                                 |
| Base Capacity (vph)     | 236                                                                               | 612                                                                               | 399                                                                               | 844                                                                               | 1051                                                                              | 517                                                                               | 225                                                                                | 1484                                                                                |                                                                                     | 419                                                                                 | 1327                                                                                | 653                                                                                 |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       | 0.22                                                                              | 0.11                                                                              | 1.13                                                                              | 1.48                                                                              | 0.49                                                                              | 0.13                                                                              | 0.88                                                                               | 0.32                                                                                |                                                                                     | 0.11                                                                                | 1.57                                                                                | 0.29                                                                                |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 11 (11%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 150

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.57

Intersection Signal Delay: 187.1

Intersection LOS: F

Intersection Capacity Utilization 124.2%

ICU Level of Service H

Analysis Period (min) 15

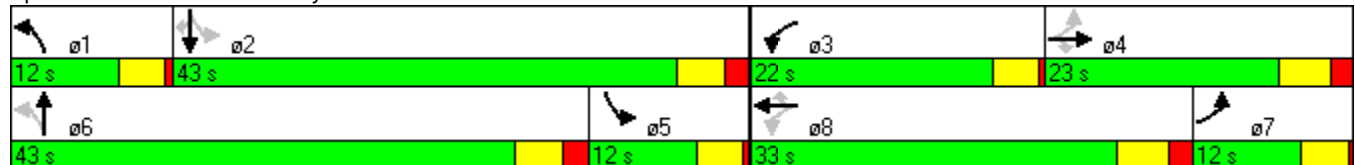
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 5: Century Ave & Centennial Rd



**Appendix Y: 2059 – Existing Conditions PM (4A2)**

Exit 161 Operational Study  
Bismarck, ND

1: Divide Ave & Bismarck Expy

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |                                                                                   |  |  |  |  |  |  |  |  |  |
| Volume (vph)            | 408                                                                               | 80                                                                                | 35                                                                                | 213                                                                               | 174                                                                               | 778                                                                               | 32                                                                                  | 1148                                                                                | 81                                                                                  | 291                                                                                 | 1240                                                                                | 188                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 150                                                                               |                                                                                   | 0                                                                                 | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                 |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                   |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 100                                                                               |                                                                                   | 25                                                                                | 100                                                                               |                                                                                   | 100                                                                               | 100                                                                                 |                                                                                     | 150                                                                                 | 100                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 25                                                                                |                                                                                   |                                                                                   | 25                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 371                                                                               |                                                                                   |                                                                                   | 341                                                                               |                                                                                   |                                                                                     | 614                                                                                 |                                                                                     |                                                                                     | 458                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 10.1                                                                              |                                                                                   |                                                                                   | 9.3                                                                               |                                                                                   |                                                                                     | 10.5                                                                                |                                                                                     |                                                                                     | 7.8                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 4%                                                                                | 1%                                                                                | 1%                                                                                | 11%                                                                               | 10%                                                                               | 22%                                                                               | 10%                                                                                 | 7%                                                                                  | 17%                                                                                 | 11%                                                                                 | 4%                                                                                  | 4%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 443                                                                               | 125                                                                               | 0                                                                                 | 232                                                                               | 189                                                                               | 846                                                                               | 35                                                                                  | 1248                                                                                | 88                                                                                  | 316                                                                                 | 1552                                                                                | 0                                                                                   |
| Turn Type               | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                              |                                                                                   | pm+ov                                                                             | Perm                                                                                |                                                                                     | Perm                                                                                | pm+pt                                                                               |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 | 5                                                                                 |                                                                                     | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                   |                                                                                     | 6                                                                                   | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 | 4                                                                                 |                                                                                   | 8                                                                                 | 8                                                                                 | 5                                                                                 | 6                                                                                   | 6                                                                                   | 6                                                                                   | 5                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               | 6.0                                                                               |                                                                                   | 6.0                                                                               | 6.0                                                                               | 5.0                                                                               | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 5.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 30.0                                                                              | 30.0                                                                              |                                                                                   | 30.0                                                                              | 30.0                                                                              | 9.8                                                                               | 22.9                                                                                | 22.9                                                                                | 22.9                                                                                | 9.8                                                                                 | 28.7                                                                                |                                                                                     |
| Total Split (s)         | 40.0                                                                              | 40.0                                                                              | 0.0                                                                               | 40.0                                                                              | 40.0                                                                              | 21.0                                                                              | 39.0                                                                                | 39.0                                                                                | 39.0                                                                                | 21.0                                                                                | 60.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 40.0%                                                                             | 40.0%                                                                             | 0.0%                                                                              | 40.0%                                                                             | 40.0%                                                                             | 21.0%                                                                             | 39.0%                                                                               | 39.0%                                                                               | 39.0%                                                                               | 21.0%                                                                               | 60.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 3.0                                                                               | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 | 3.0                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 1.0                                                                               | 1.8                                                                                 | 1.8                                                                                 | 1.8                                                                                 | 1.0                                                                                 | 1.8                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 5.7                                                                                 | 5.7                                                                                 | 5.7                                                                                 | 4.0                                                                                 | 5.7                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lag                                                                               | Lead                                                                                | Lead                                                                                | Lead                                                                                | Lag                                                                                 |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                               | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 |                                                                                     |                                                                                     |
| Recall Mode             | None                                                                              | None                                                                              |                                                                                   | None                                                                              | None                                                                              | None                                                                              | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               | None                                                                                | C-Min                                                                               |                                                                                     |
| Act Effect Green (s)    | 34.0                                                                              | 34.0                                                                              |                                                                                   | 34.0                                                                              | 34.0                                                                              | 57.0                                                                              | 33.3                                                                                | 33.3                                                                                | 33.3                                                                                | 56.0                                                                                | 54.3                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.34                                                                              | 0.34                                                                              |                                                                                   | 0.34                                                                              | 0.34                                                                              | 0.57                                                                              | 0.33                                                                                | 0.33                                                                                | 0.33                                                                                | 0.56                                                                                | 0.54                                                                                |                                                                                     |
| v/c Ratio               | 1.18                                                                              | 0.20                                                                              |                                                                                   | 0.59                                                                              | 0.32                                                                              | 1.12                                                                              | 0.51                                                                                | 1.11                                                                                | 0.17                                                                                | 0.92                                                                                | 0.83                                                                                |                                                                                     |
| Control Delay           | 136.5                                                                             | 19.8                                                                              |                                                                                   | 34.6                                                                              | 26.4                                                                              | 93.3                                                                              | 56.3                                                                                | 95.2                                                                                | 9.9                                                                                 | 64.0                                                                                | 21.0                                                                                |                                                                                     |
| Queue Delay             | 12.3                                                                              | 0.0                                                                               |                                                                                   | 0.0                                                                               | 0.0                                                                               | 10.2                                                                              | 0.0                                                                                 | 6.4                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 1.2                                                                                 |                                                                                     |
| Total Delay             | 148.8                                                                             | 19.8                                                                              |                                                                                   | 34.6                                                                              | 26.4                                                                              | 103.5                                                                             | 56.3                                                                                | 101.6                                                                               | 9.9                                                                                 | 64.0                                                                                | 22.2                                                                                |                                                                                     |
| LOS                     | F                                                                                 | B                                                                                 |                                                                                   | C                                                                                 | C                                                                                 | F                                                                                 | E                                                                                   | F                                                                                   | A                                                                                   | E                                                                                   | C                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 120.4                                                                             |                                                                                   |                                                                                   | 79.3                                                                              |                                                                                   |                                                                                     | 94.5                                                                                |                                                                                     |                                                                                     | 29.3                                                                                |                                                                                     |
| Approach LOS            |                                                                                   | F                                                                                 |                                                                                   |                                                                                   | E                                                                                 |                                                                                   |                                                                                     | F                                                                                   |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | ~340                                                                              | 45                                                                                |                                                                                   | 121                                                                               | 89                                                                                | ~624                                                                              | 18                                                                                  | ~481                                                                                | 10                                                                                  | 165                                                                                 | 283                                                                                 |                                                                                     |
| Queue Length 95th (ft)  | #531                                                                              | 88                                                                                |                                                                                   | 204                                                                               | 147                                                                               | #861                                                                              | #66                                                                                 | #614                                                                                | 45                                                                                  | m#303                                                                               | 481                                                                                 |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 291                                                                               |                                                                                   |                                                                                   | 261                                                                               |                                                                                   |                                                                                    | 534                                                                                 |                                                                                     |                                                                                     | 378                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 150                                                                               |                                                                                   |                                                                                   | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 376                                                                               | 626                                                                               |                                                                                   | 394                                                                               | 587                                                                               | 757                                                                               | 69                                                                                 | 1124                                                                                | 503                                                                                 | 345                                                                                 | 1859                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 133                                                                                 |                                                                                     |
| Spillback Cap Reductn   | 9                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 16                                                                                | 0                                                                                  | 15                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 1.21                                                                              | 0.20                                                                              |                                                                                   | 0.59                                                                              | 0.32                                                                              | 1.14                                                                              | 0.51                                                                               | 1.13                                                                                | 0.17                                                                                | 0.92                                                                                | 0.90                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 16 (16%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.18

Intersection Signal Delay: 69.6

Intersection LOS: E

Intersection Capacity Utilization 115.6%

ICU Level of Service H

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

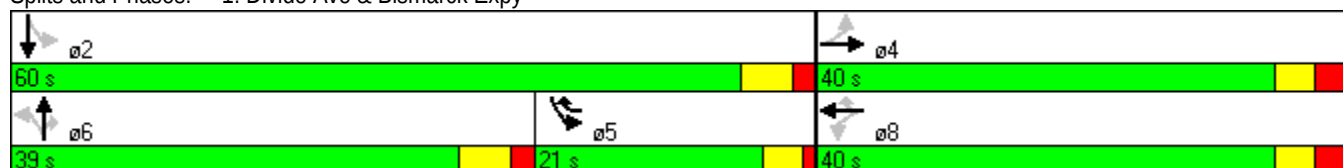
Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Divide Ave & Bismarck Expy



|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |                                                                                   |  |                                                                                   |                                                                                   |                                                                                   |                                                                                    |  |  |  |  |                                                                                     |
| Volume (vph)            | 418                                                                               | 0                                                                                 | 561                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 1862                                                                                | 182                                                                                 | 46                                                                                  | 939                                                                                 | 0                                                                                   |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                 | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 200                                                                               |                                                                                   | 200                                                                               | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  |                                                                                     | 0                                                                                   | 222                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 2                                                                                 |                                                                                   | 2                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 300                                                                               | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                 |                                                                                     | 25                                                                                  | 150                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                    |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                    | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 575                                                                               |                                                                                   |                                                                                   | 383                                                                               |                                                                                   |                                                                                    | 458                                                                                 |                                                                                     |                                                                                     | 769                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 13.1                                                                              |                                                                                   |                                                                                   | 8.7                                                                               |                                                                                   |                                                                                    | 7.8                                                                                 |                                                                                     |                                                                                     | 13.1                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                               | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                               | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 3%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                 | 8%                                                                                  | 27%                                                                                 | 10%                                                                                 | 9%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 454                                                                               | 0                                                                                 | 610                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 2024                                                                                | 198                                                                                 | 50                                                                                  | 1021                                                                                | 0                                                                                   |
| Turn Type               | custom                                                                            |                                                                                   | custom                                                                            |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     | Perm                                                                                | Perm                                                                                |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     | 6                                                                                   | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                   | 6                                                                                   | 2                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               |                                                                                   | 6.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 21.1                                                                              |                                                                                   | 21.1                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 23.4                                                                                | 23.4                                                                                | 21.4                                                                                | 21.4                                                                                |                                                                                     |
| Total Split (s)         | 24.0                                                                              | 0.0                                                                               | 24.0                                                                              | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 76.0                                                                                | 76.0                                                                                | 76.0                                                                                | 76.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 24.0%                                                                             | 0.0%                                                                              | 24.0%                                                                             | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                               | 76.0%                                                                               | 76.0%                                                                               | 76.0%                                                                               | 76.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.6                                                                               |                                                                                   | 3.6                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 1.5                                                                               |                                                                                   | 1.5                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 1.5                                                                                 | 1.5                                                                                 | 1.5                                                                                 | 1.5                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 5.1                                                                               | 4.0                                                                               | 5.1                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                                | 5.4                                                                                 | 5.4                                                                                 | 5.4                                                                                 | 5.4                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Recall Mode             | None                                                                              |                                                                                   | None                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               |                                                                                     |
| Act Effct Green (s)     | 17.8                                                                              |                                                                                   | 17.8                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 71.7                                                                                | 71.7                                                                                | 71.7                                                                                | 71.7                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.18                                                                              |                                                                                   | 0.18                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.72                                                                                | 0.72                                                                                | 0.72                                                                                | 0.72                                                                                |                                                                                     |
| v/c Ratio               | 0.75                                                                              |                                                                                   | 0.83                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.84                                                                                | 0.20                                                                                | 0.72                                                                                | 0.43                                                                                |                                                                                     |
| Control Delay           | 47.4                                                                              |                                                                                   | 31.7                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 7.4                                                                                 | 0.1                                                                                 | 57.9                                                                                | 0.6                                                                                 |                                                                                     |
| Queue Delay             | 0.0                                                                               |                                                                                   | 0.4                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 14.1                                                                                | 0.0                                                                                 | 0.0                                                                                 | 0.1                                                                                 |                                                                                     |
| Total Delay             | 47.4                                                                              |                                                                                   | 32.2                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 21.6                                                                                | 0.1                                                                                 | 57.9                                                                                | 0.6                                                                                 |                                                                                     |
| LOS                     | D                                                                                 |                                                                                   | C                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | C                                                                                   | A                                                                                   | E                                                                                   | A                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 19.6                                                                                |                                                                                     |                                                                                     | 3.3                                                                                 |                                                                                     |
| Approach LOS            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | B                                                                                   |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 140                                                                               |                                                                                   | 113                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 323                                                                                 | 0                                                                                   | 12                                                                                  | 0                                                                                   |                                                                                     |
| Queue Length 95th (ft)  | 195                                                                               |                                                                                   | #193                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | m235                                                                                | m0                                                                                  | m#23                                                                                | 0                                                                                   |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 495                                                                               |                                                                                   |                                                                                   | 303                                                                               |                                                                                   |                                                                                    | 378                                                                                 |                                                                                     |                                                                                     | 689                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 200                                                                               |                                                                                   | 200                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | 222                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 643                                                                               |                                                                                   | 760                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 2398                                                                                | 968                                                                                 | 69                                                                                  | 2376                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 406                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 |                                                                                   | 18                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 216                                                                                 |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.71                                                                              |                                                                                   | 0.82                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 1.02                                                                                | 0.20                                                                                | 0.72                                                                                | 0.47                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 92 (92%), Referenced to phase 2:SBTL and 6:NBT, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.84

Intersection Signal Delay: 20.3

Intersection LOS: C

Intersection Capacity Utilization 81.6%

ICU Level of Service D

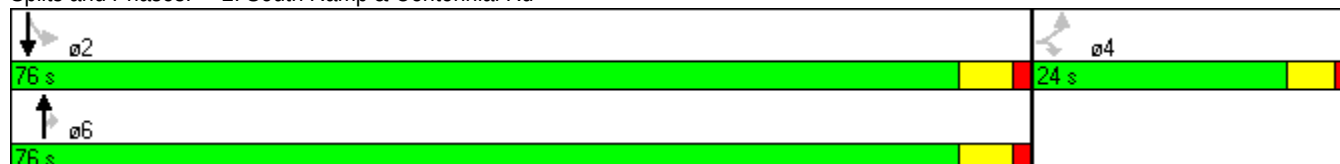
Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: South Ramp & Centennial Rd



|                         |  |  |  |  |  |  |   |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |                                                                                   |                                                                                   |                                                                                   |  |                                                                                   |  |  |  |                                                                                     |                                                                                     |  |  |
| Volume (vph)            | 0                                                                                 | 0                                                                                 | 0                                                                                 | 210                                                                               | 0                                                                                 | 45                                                                                | 501                                                                                 | 1424                                                                                | 0                                                                                   | 0                                                                                   | 838                                                                                 | 233                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 16                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 150                                                                               | 215                                                                                 |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     | 200                                                                                 |
| Storage Lanes           | 0                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     | 1                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 100                                                                               | 150                                                                                 |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 270                                                                               |                                                                                   |                                                                                   | 465                                                                               |                                                                                   |                                                                                     | 769                                                                                 |                                                                                     |                                                                                     | 787                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 6.1                                                                               |                                                                                   |                                                                                   | 10.6                                                                              |                                                                                   |                                                                                     | 13.1                                                                                |                                                                                     |                                                                                     | 13.4                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                | 2%                                                                                | 2%                                                                                | 12%                                                                               | 2%                                                                                | 8%                                                                                | 6%                                                                                  | 3%                                                                                  | 2%                                                                                  | 2%                                                                                  | 3%                                                                                  | 1%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 228                                                                               | 0                                                                                 | 49                                                                                | 545                                                                                 | 1548                                                                                | 0                                                                                   | 0                                                                                   | 911                                                                                 | 253                                                                                 |
| Turn Type               |                                                                                   |                                                                                   |                                                                                   | custom                                                                            |                                                                                   | custom                                                                            | pm+pt                                                                               |                                                                                     |                                                                                     |                                                                                     |                                                                                     | Perm                                                                                |
| Protected Phases        |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        |                                                                                   |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     | 2                                                                                   |
| Detector Phase          |                                                                                   |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 8                                                                                 | 1                                                                                   | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   | 2                                                                                   |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     |                                                                                   |                                                                                   |                                                                                   | 5.0                                                                               |                                                                                   | 5.0                                                                               | 5.0                                                                                 | 10.0                                                                                |                                                                                     |                                                                                     | 10.0                                                                                | 10.0                                                                                |
| Minimum Split (s)       |                                                                                   |                                                                                   |                                                                                   | 20.0                                                                              |                                                                                   | 20.0                                                                              | 9.0                                                                                 | 20.0                                                                                |                                                                                     |                                                                                     | 22.4                                                                                | 22.4                                                                                |
| Total Split (s)         | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 22.0                                                                              | 0.0                                                                               | 22.0                                                                              | 37.0                                                                                | 78.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 41.0                                                                                | 41.0                                                                                |
| Total Split (%)         | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                              | 22.0%                                                                             | 0.0%                                                                              | 22.0%                                                                             | 37.0%                                                                               | 78.0%                                                                               | 0.0%                                                                                | 0.0%                                                                                | 41.0%                                                                               | 41.0%                                                                               |
| Yellow Time (s)         |                                                                                   |                                                                                   |                                                                                   | 3.2                                                                               |                                                                                   | 3.2                                                                               | 3.0                                                                                 | 3.9                                                                                 |                                                                                     |                                                                                     | 3.9                                                                                 | 3.9                                                                                 |
| All-Red Time (s)        |                                                                                   |                                                                                   |                                                                                   | 2.0                                                                               |                                                                                   | 2.0                                                                               | 1.0                                                                                 | 1.5                                                                                 |                                                                                     |                                                                                     | 1.5                                                                                 | 1.5                                                                                 |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 5.2                                                                               | 4.0                                                                               | 5.2                                                                               | 4.0                                                                                 | 5.4                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 5.4                                                                                 | 5.4                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lag                                                                                 |                                                                                     |                                                                                     |                                                                                     | Lead                                                                                | Lead                                                                                |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                                 |                                                                                     |                                                                                     |                                                                                     | Yes                                                                                 | Yes                                                                                 |
| Recall Mode             |                                                                                   |                                                                                   |                                                                                   | None                                                                              |                                                                                   | None                                                                              | None                                                                                | C-Min                                                                               |                                                                                     |                                                                                     | C-Min                                                                               | C-Min                                                                               |
| Act Effect Green (s)    |                                                                                   |                                                                                   |                                                                                   | 15.2                                                                              |                                                                                   | 15.2                                                                              | 75.6                                                                                | 74.2                                                                                |                                                                                     |                                                                                     | 39.7                                                                                | 39.7                                                                                |
| Actuated g/C Ratio      |                                                                                   |                                                                                   |                                                                                   | 0.15                                                                              |                                                                                   | 0.15                                                                              | 0.76                                                                                | 0.74                                                                                |                                                                                     |                                                                                     | 0.40                                                                                | 0.40                                                                                |
| v/c Ratio               |                                                                                   |                                                                                   |                                                                                   | 0.82                                                                              |                                                                                   | 0.18                                                                              | 0.80                                                                                | 0.60                                                                                |                                                                                     |                                                                                     | 0.66                                                                                | 0.32                                                                                |
| Control Delay           |                                                                                   |                                                                                   |                                                                                   | 64.5                                                                              |                                                                                   | 12.3                                                                              | 27.4                                                                                | 6.3                                                                                 |                                                                                     |                                                                                     | 26.5                                                                                | 4.0                                                                                 |
| Queue Delay             |                                                                                   |                                                                                   |                                                                                   | 0.0                                                                               |                                                                                   | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |                                                                                     | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             |                                                                                   |                                                                                   |                                                                                   | 64.5                                                                              |                                                                                   | 12.3                                                                              | 27.4                                                                                | 6.3                                                                                 |                                                                                     |                                                                                     | 26.5                                                                                | 4.0                                                                                 |
| LOS                     |                                                                                   |                                                                                   |                                                                                   | E                                                                                 |                                                                                   | B                                                                                 | C                                                                                   | A                                                                                   |                                                                                     |                                                                                     | C                                                                                   | A                                                                                   |
| Approach Delay          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 11.8                                                                                |                                                                                     |                                                                                     | 21.6                                                                                |                                                                                     |
| Approach LOS            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     | B                                                                                   |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |
| Queue Length 50th (ft)  |                                                                                   |                                                                                   |                                                                                   | 140                                                                               |                                                                                   | 0                                                                                 | 191                                                                                 | 208                                                                                 |                                                                                     |                                                                                     | 279                                                                                 | 3                                                                                   |
| Queue Length 95th (ft)  |                                                                                   |                                                                                   |                                                                                   | #248                                                                              |                                                                                   | 32                                                                                | m321                                                                                | 231                                                                                 |                                                                                     |                                                                                     | 333                                                                                 | m36                                                                                 |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 190                                                                               |                                                                                   |                                                                                   | 385                                                                               |                                                                                   |                                                                                    | 689                                                                                 |                                                                                     |                                                                                     | 707                                                                                 |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 150                                                                               | 215                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     | 200                                                                                 |
| Base Capacity (vph)     |                                                                                   |                                                                                   |                                                                                   | 307                                                                               |                                                                                   | 292                                                                               | 723                                                                                | 2601                                                                                |                                                                                     |                                                                                     | 1390                                                                                | 787                                                                                 |
| Starvation Cap Reductn  |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     |                                                                                     | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     |                                                                                     | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     |                                                                                     | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       |                                                                                   |                                                                                   |                                                                                   | 0.74                                                                              |                                                                                   | 0.17                                                                              | 0.75                                                                               | 0.60                                                                                |                                                                                     |                                                                                     | 0.66                                                                                | 0.32                                                                                |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 9 (9%), Referenced to phase 2:SBT and 6:NBTL, Start of Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.82

Intersection Signal Delay: 18.4

Intersection LOS: B

Intersection Capacity Utilization 81.6%

ICU Level of Service D

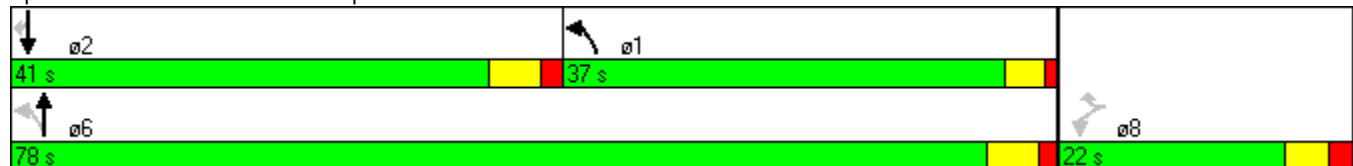
Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: North Ramp & Centennial Rd



|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |                                                                                   |  |  |  |  |                                                                                   |  |  |                                                                                     |  |  |                                                                                     |
| Volume (veh/h)                    | 28                                                                                | 5                                                                                 | 170                                                                               | 236                                                                               | 2                                                                                 | 149                                                                               | 194                                                                                 | 2017                                                                                | 365                                                                                 | 51                                                                                  | 800                                                                                 | 22                                                                                  |
| Sign Control                      |                                                                                   | Stop                                                                              |                                                                                   |                                                                                   | Stop                                                                              |                                                                                   |                                                                                     | Free                                                                                |                                                                                     |                                                                                     | Free                                                                                |                                                                                     |
| Grade                             |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Peak Hour Factor                  | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Hourly flow rate (vph)            | 30                                                                                | 5                                                                                 | 185                                                                               | 257                                                                               | 2                                                                                 | 162                                                                               | 211                                                                                 | 2192                                                                                | 397                                                                                 | 55                                                                                  | 870                                                                                 | 24                                                                                  |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Width (ft)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Walking Speed (ft/s)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Right turn flare (veh)            |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Median type                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     | None                                                                                |                                                                                     |                                                                                     | None                                                                                |                                                                                     |
| Median storage (veh)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Upstream signal (ft)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 787                                                                                 |                                                                                     |                                                                                     | 1293                                                                                |                                                                                     |
| pX, platoon unblocked             | 0.79                                                                              | 0.79                                                                              |                                                                                   | 0.79                                                                              | 0.79                                                                              | 0.79                                                                              |                                                                                     |                                                                                     |                                                                                     | 0.79                                                                                |                                                                                     |                                                                                     |
| vC, conflicting volume            | 2673                                                                              | 4003                                                                              | 447                                                                               | 3361                                                                              | 3817                                                                              | 1295                                                                              | 893                                                                                 |                                                                                     |                                                                                     | 2589                                                                                |                                                                                     |                                                                                     |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vCu, unblocked vol                | 2585                                                                              | 4274                                                                              | 447                                                                               | 3458                                                                              | 4037                                                                              | 835                                                                               | 893                                                                                 |                                                                                     |                                                                                     | 2478                                                                                |                                                                                     |                                                                                     |
| tC, single (s)                    | 7.5                                                                               | 6.5                                                                               | 6.9                                                                               | 7.5                                                                               | 6.5                                                                               | 6.9                                                                               | 4.1                                                                                 |                                                                                     |                                                                                     | 4.1                                                                                 |                                                                                     |                                                                                     |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| tF (s)                            | 3.5                                                                               | 4.0                                                                               | 3.3                                                                               | 3.5                                                                               | 4.0                                                                               | 3.3                                                                               | 2.2                                                                                 |                                                                                     |                                                                                     | 2.2                                                                                 |                                                                                     |                                                                                     |
| p0 queue free %                   | 0                                                                                 | 0                                                                                 | 67                                                                                | 0                                                                                 | 0                                                                                 | 34                                                                                | 72                                                                                  |                                                                                     |                                                                                     | 62                                                                                  |                                                                                     |                                                                                     |
| cM capacity (veh/h)               | 0                                                                                 | 1                                                                                 | 559                                                                               | 0                                                                                 | 1                                                                                 | 245                                                                               | 755                                                                                 |                                                                                     |                                                                                     | 144                                                                                 |                                                                                     |                                                                                     |
| Direction, Lane #                 | EB 1                                                                              | WB 1                                                                              | WB 2                                                                              | NB 1                                                                              | NB 2                                                                              | NB 3                                                                              | SB 1                                                                                | SB 2                                                                                | SB 3                                                                                |                                                                                     |                                                                                     |                                                                                     |
| Volume Total                      | 221                                                                               | 257                                                                               | 164                                                                               | 211                                                                               | 1462                                                                              | 1128                                                                              | 55                                                                                  | 580                                                                                 | 314                                                                                 |                                                                                     |                                                                                     |                                                                                     |
| Volume Left                       | 30                                                                                | 257                                                                               | 0                                                                                 | 211                                                                               | 0                                                                                 | 0                                                                                 | 55                                                                                  | 0                                                                                   | 0                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Volume Right                      | 185                                                                               | 0                                                                                 | 162                                                                               | 0                                                                                 | 0                                                                                 | 397                                                                               | 0                                                                                   | 0                                                                                   | 24                                                                                  |                                                                                     |                                                                                     |                                                                                     |
| cSH                               | 0                                                                                 | 0                                                                                 | 55                                                                                | 755                                                                               | 1700                                                                              | 1700                                                                              | 144                                                                                 | 1700                                                                                | 1700                                                                                |                                                                                     |                                                                                     |                                                                                     |
| Volume to Capacity                | 4673.94                                                                           | Err                                                                               | 3.00                                                                              | 0.28                                                                              | 0.86                                                                              | 0.66                                                                              | 0.38                                                                                | 0.34                                                                                | 0.18                                                                                |                                                                                     |                                                                                     |                                                                                     |
| Queue Length 95th (ft)            | Err                                                                               | Err                                                                               | 431                                                                               | 29                                                                                | 0                                                                                 | 0                                                                                 | 41                                                                                  | 0                                                                                   | 0                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Control Delay (s)                 | Err                                                                               | Err                                                                               | 1058.6                                                                            | 11.6                                                                              | 0.0                                                                               | 0.0                                                                               | 44.8                                                                                | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |                                                                                     |                                                                                     |
| Lane LOS                          | F                                                                                 | F                                                                                 | F                                                                                 | B                                                                                 |                                                                                   |                                                                                   | E                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach Delay (s)                | Err                                                                               | Err                                                                               |                                                                                   | 0.9                                                                               |                                                                                   |                                                                                   | 2.6                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach LOS                      | F                                                                                 | F                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Average Delay                     |                                                                                   |                                                                                   | Err                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 100.5%                                                                            |                                                                                   | ICU Level of Service                                                              |                                                                                   |                                                                                     |                                                                                     | G                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |  |  |  |  |  |  |  |  |  |  |
| Volume (vph)            | 149                                                                               | 459                                                                               | 387                                                                               | 235                                                                               | 189                                                                               | 46                                                                                | 252                                                                                 | 798                                                                                 | 343                                                                                 | 78                                                                                  | 534                                                                                 | 66                                                                                  |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                                 |                                                                                     | 0                                                                                   | 215                                                                                 |                                                                                     | 215                                                                                 |
| Storage Lanes           | 1                                                                                 |                                                                                   | 1                                                                                 | 2                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                   |                                                                                     | 0                                                                                   | 1                                                                                   |                                                                                     | 1                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                  |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 35                                                                                |                                                                                   |                                                                                   | 35                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 672                                                                               |                                                                                   |                                                                                   | 603                                                                               |                                                                                   |                                                                                     | 1293                                                                                |                                                                                     |                                                                                     | 519                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 13.1                                                                              |                                                                                   |                                                                                   | 11.7                                                                              |                                                                                   |                                                                                     | 22.0                                                                                |                                                                                     |                                                                                     | 8.8                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 162                                                                               | 499                                                                               | 421                                                                               | 255                                                                               | 205                                                                               | 50                                                                                | 274                                                                                 | 1240                                                                                | 0                                                                                   | 85                                                                                  | 580                                                                                 | 72                                                                                  |
| Turn Type               | pm+pt                                                                             |                                                                                   | Perm                                                                              | pm+pt                                                                             |                                                                                   | Perm                                                                              | pm+pt                                                                               |                                                                                     |                                                                                     | pm+pt                                                                               |                                                                                     | Perm                                                                                |
| Protected Phases        | 7                                                                                 | 4                                                                                 |                                                                                   | 3                                                                                 | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     | 2                                                                                   |
| Detector Phase          | 7                                                                                 | 4                                                                                 | 4                                                                                 | 3                                                                                 | 8                                                                                 | 8                                                                                 | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   | 2                                                                                   |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 4.0                                                                               | 10.0                                                                              | 10.0                                                                              | 4.0                                                                               | 10.0                                                                              | 10.0                                                                              | 4.0                                                                                 | 6.0                                                                                 |                                                                                     | 4.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 |
| Minimum Split (s)       | 8.0                                                                               | 15.7                                                                              | 15.7                                                                              | 8.0                                                                               | 21.7                                                                              | 21.7                                                                              | 8.0                                                                                 | 11.5                                                                                |                                                                                     | 8.0                                                                                 | 11.5                                                                                | 11.5                                                                                |
| Total Split (s)         | 13.0                                                                              | 25.0                                                                              | 25.0                                                                              | 13.0                                                                              | 25.0                                                                              | 25.0                                                                              | 20.0                                                                                | 50.0                                                                                | 0.0                                                                                 | 12.0                                                                                | 42.0                                                                                | 42.0                                                                                |
| Total Split (%)         | 13.0%                                                                             | 25.0%                                                                             | 25.0%                                                                             | 13.0%                                                                             | 25.0%                                                                             | 25.0%                                                                             | 20.0%                                                                               | 50.0%                                                                               | 0.0%                                                                                | 12.0%                                                                               | 42.0%                                                                               | 42.0%                                                                               |
| Yellow Time (s)         | 3.5                                                                               | 3.9                                                                               | 3.9                                                                               | 3.5                                                                               | 3.9                                                                               | 3.9                                                                               | 3.5                                                                                 | 3.6                                                                                 |                                                                                     | 3.5                                                                                 | 3.6                                                                                 | 3.6                                                                                 |
| All-Red Time (s)        | 0.5                                                                               | 1.8                                                                               | 1.8                                                                               | 0.5                                                                               | 1.8                                                                               | 1.8                                                                               | 0.5                                                                                 | 1.9                                                                                 |                                                                                     | 0.5                                                                                 | 1.9                                                                                 | 1.9                                                                                 |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 5.7                                                                               | 5.7                                                                               | 4.0                                                                               | 5.7                                                                               | 5.7                                                                               | 4.0                                                                                 | 5.5                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 5.5                                                                                 | 5.5                                                                                 |
| Lead/Lag                | Lead                                                                              | Lag                                                                               | Lag                                                                               | Lead                                                                              | Lag                                                                               | Lag                                                                               | Lead                                                                                | Lag                                                                                 |                                                                                     | Lead                                                                                | Lag                                                                                 | Lag                                                                                 |
| Lead-Lag Optimize?      | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                                 | Yes                                                                                 |                                                                                     | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 |
| Recall Mode             | None                                                                              | Max                                                                               | Max                                                                               | None                                                                              | Max                                                                               | Max                                                                               | None                                                                                | C-Max                                                                               |                                                                                     | None                                                                                | C-Max                                                                               | C-Max                                                                               |
| Act Effect Green (s)    | 29.8                                                                              | 19.3                                                                              | 19.3                                                                              | 29.8                                                                              | 19.3                                                                              | 19.3                                                                              | 58.2                                                                                | 47.4                                                                                |                                                                                     | 48.5                                                                                | 39.7                                                                                | 39.7                                                                                |
| Actuated g/C Ratio      | 0.30                                                                              | 0.19                                                                              | 0.19                                                                              | 0.30                                                                              | 0.19                                                                              | 0.19                                                                              | 0.58                                                                                | 0.47                                                                                |                                                                                     | 0.48                                                                                | 0.40                                                                                | 0.40                                                                                |
| v/c Ratio               | 0.41                                                                              | 0.73                                                                              | 0.73                                                                              | 0.50                                                                              | 0.30                                                                              | 0.14                                                                              | 0.54                                                                                | 0.75                                                                                |                                                                                     | 0.38                                                                                | 0.41                                                                                | 0.11                                                                                |
| Control Delay           | 27.9                                                                              | 45.1                                                                              | 17.6                                                                              | 27.4                                                                              | 36.0                                                                              | 10.9                                                                              | 12.1                                                                                | 22.6                                                                                |                                                                                     | 15.7                                                                                | 23.4                                                                                | 5.6                                                                                 |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 |                                                                                     | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             | 27.9                                                                              | 45.1                                                                              | 17.6                                                                              | 27.4                                                                              | 36.0                                                                              | 10.9                                                                              | 12.1                                                                                | 22.6                                                                                |                                                                                     | 15.7                                                                                | 23.4                                                                                | 5.6                                                                                 |
| LOS                     | C                                                                                 | D                                                                                 | B                                                                                 | C                                                                                 | D                                                                                 | B                                                                                 | B                                                                                   | C                                                                                   |                                                                                     | B                                                                                   | C                                                                                   | A                                                                                   |
| Approach Delay          |                                                                                   | 31.8                                                                              |                                                                                   |                                                                                   | 29.2                                                                              |                                                                                   |                                                                                     | 20.7                                                                                |                                                                                     |                                                                                     | 20.7                                                                                |                                                                                     |
| Approach LOS            |                                                                                   | C                                                                                 |                                                                                   |                                                                                   | C                                                                                 |                                                                                   |                                                                                     | C                                                                                   |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 74                                                                                | 158                                                                               | 50                                                                                | 59                                                                                | 59                                                                                | 0                                                                                 | 73                                                                                  | 355                                                                                 |                                                                                     | 22                                                                                  | 138                                                                                 | 0                                                                                   |
| Queue Length 95th (ft)  | 127                                                                               | 216                                                                               | 165                                                                               | 89                                                                                | 93                                                                                | 31                                                                                | 111                                                                                 | 436                                                                                 |                                                                                     | 43                                                                                  | 195                                                                                 | 28                                                                                  |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 592                                                                               |                                                                                   |                                                                                   | 523                                                                               |                                                                                   |                                                                                    | 1213                                                                                |                                                                                     |                                                                                     | 439                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                                |                                                                                     |                                                                                     | 215                                                                                 |                                                                                     | 215                                                                                 |
| Base Capacity (vph)     | 403                                                                               | 683                                                                               | 573                                                                               | 516                                                                               | 684                                                                               | 346                                                                               | 540                                                                                | 1647                                                                                |                                                                                     | 236                                                                                 | 1406                                                                                | 673                                                                                 |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       | 0.40                                                                              | 0.73                                                                              | 0.73                                                                              | 0.49                                                                              | 0.30                                                                              | 0.14                                                                              | 0.51                                                                               | 0.75                                                                                |                                                                                     | 0.36                                                                                | 0.41                                                                                | 0.11                                                                                |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 80 (80%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 70

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.75

Intersection Signal Delay: 25.0

Intersection LOS: C

Intersection Capacity Utilization 72.7%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 5: Century Ave & Centennial Rd

|                                                                                        |                                                                                        |                                                                                         |                                                                                          |
|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
|  ø1   |  ø2   |  ø3   |  ø4   |
| 20 s                                                                                   | 42 s                                                                                   | 13 s                                                                                    | 25 s                                                                                     |
|  ø5 |  ø6 |  ø7 |  ø8 |
| 12 s                                                                                   | 50 s                                                                                   | 13 s                                                                                    | 25 s                                                                                     |

## **Appendix Z: 2059 - Signal at Trenton AM (4B1)**

Exit 161 Operational Study  
Bismarck, ND

1: Divide Ave & Bismarck Expy

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |                                                                                   |  |  |  |  |  |  |  |  |  |
| Volume (vph)            | 161                                                                               | 173                                                                               | 25                                                                                | 267                                                                               | 182                                                                               | 623                                                                               | 34                                                                                  | 578                                                                                 | 97                                                                                  | 462                                                                                 | 1584                                                                                | 353                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 150                                                                               |                                                                                   | 0                                                                                 | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                 |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                   |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 100                                                                               |                                                                                   | 25                                                                                | 100                                                                               |                                                                                   | 100                                                                               | 100                                                                                 |                                                                                     | 150                                                                                 | 100                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 25                                                                                |                                                                                   |                                                                                   | 25                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 371                                                                               |                                                                                   |                                                                                   | 341                                                                               |                                                                                   |                                                                                     | 614                                                                                 |                                                                                     |                                                                                     | 458                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 10.1                                                                              |                                                                                   |                                                                                   | 9.3                                                                               |                                                                                   |                                                                                     | 10.5                                                                                |                                                                                     |                                                                                     | 7.8                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 4%                                                                                | 1%                                                                                | 1%                                                                                | 11%                                                                               | 10%                                                                               | 22%                                                                               | 10%                                                                                 | 7%                                                                                  | 17%                                                                                 | 11%                                                                                 | 4%                                                                                  | 4%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 175                                                                               | 215                                                                               | 0                                                                                 | 290                                                                               | 198                                                                               | 677                                                                               | 37                                                                                  | 628                                                                                 | 105                                                                                 | 502                                                                                 | 2106                                                                                | 0                                                                                   |
| Turn Type               | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                              |                                                                                   | pm+ov                                                                             | Perm                                                                                |                                                                                     | Perm                                                                                | pm+pt                                                                               |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 | 5                                                                                 |                                                                                     | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                   |                                                                                     | 6                                                                                   | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 | 4                                                                                 |                                                                                   | 8                                                                                 | 8                                                                                 | 5                                                                                 | 6                                                                                   | 6                                                                                   | 6                                                                                   | 5                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               | 6.0                                                                               |                                                                                   | 6.0                                                                               | 6.0                                                                               | 5.0                                                                               | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 5.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 30.0                                                                              | 30.0                                                                              |                                                                                   | 30.0                                                                              | 30.0                                                                              | 9.8                                                                               | 22.9                                                                                | 22.9                                                                                | 22.9                                                                                | 9.8                                                                                 | 28.7                                                                                |                                                                                     |
| Total Split (s)         | 34.0                                                                              | 34.0                                                                              | 0.0                                                                               | 34.0                                                                              | 34.0                                                                              | 35.4                                                                              | 30.6                                                                                | 30.6                                                                                | 30.6                                                                                | 35.4                                                                                | 66.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 34.0%                                                                             | 34.0%                                                                             | 0.0%                                                                              | 34.0%                                                                             | 34.0%                                                                             | 35.4%                                                                             | 30.6%                                                                               | 30.6%                                                                               | 30.6%                                                                               | 35.4%                                                                               | 66.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 3.0                                                                               | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 | 3.0                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 1.0                                                                               | 1.8                                                                                 | 1.8                                                                                 | 1.8                                                                                 | 1.0                                                                                 | 1.8                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 5.7                                                                                 | 5.7                                                                                 | 5.7                                                                                 | 4.0                                                                                 | 5.7                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lead                                                                              | Lag                                                                                 | Lag                                                                                 | Lag                                                                                 | Lead                                                                                |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                               | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 |                                                                                     |                                                                                     |
| Recall Mode             | None                                                                              | None                                                                              |                                                                                   | None                                                                              | None                                                                              | None                                                                              | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               | None                                                                                | C-Min                                                                               |                                                                                     |
| Act Effect Green (s)    | 28.0                                                                              | 28.0                                                                              |                                                                                   | 28.0                                                                              | 28.0                                                                              | 61.3                                                                              | 29.0                                                                                | 29.0                                                                                | 29.0                                                                                | 62.0                                                                                | 60.3                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.28                                                                              | 0.28                                                                              |                                                                                   | 0.28                                                                              | 0.28                                                                              | 0.61                                                                              | 0.29                                                                                | 0.29                                                                                | 0.29                                                                                | 0.62                                                                                | 0.60                                                                                |                                                                                     |
| v/c Ratio               | 0.60                                                                              | 0.41                                                                              |                                                                                   | 1.12                                                                              | 0.41                                                                              | 0.82                                                                              | 0.54                                                                                | 0.64                                                                                | 0.22                                                                                | 0.86                                                                                | 1.02                                                                                |                                                                                     |
| Control Delay           | 41.3                                                                              | 31.2                                                                              |                                                                                   | 127.6                                                                             | 32.4                                                                              | 23.2                                                                              | 65.0                                                                                | 35.8                                                                                | 7.4                                                                                 | 28.3                                                                                | 37.1                                                                                |                                                                                     |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 36.7                                                                                |                                                                                     |
| Total Delay             | 41.3                                                                              | 31.2                                                                              |                                                                                   | 127.6                                                                             | 32.4                                                                              | 23.2                                                                              | 65.0                                                                                | 35.8                                                                                | 7.4                                                                                 | 28.3                                                                                | 73.8                                                                                |                                                                                     |
| LOS                     | D                                                                                 | C                                                                                 |                                                                                   | F                                                                                 | C                                                                                 | C                                                                                 | E                                                                                   | D                                                                                   | A                                                                                   | C                                                                                   | E                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 35.7                                                                              |                                                                                   |                                                                                   | 50.7                                                                              |                                                                                   |                                                                                     | 33.3                                                                                |                                                                                     |                                                                                     | 65.0                                                                                |                                                                                     |
| Approach LOS            |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | D                                                                                 |                                                                                   |                                                                                     | C                                                                                   |                                                                                     |                                                                                     | E                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 97                                                                                | 108                                                                               |                                                                                   | ~214                                                                              | 103                                                                               | 263                                                                               | 21                                                                                  | 193                                                                                 | 0                                                                                   | 205                                                                                 | ~606                                                                                |                                                                                     |
| Queue Length 95th (ft)  | 172                                                                               | 176                                                                               |                                                                                   | #377                                                                              | 168                                                                               | 435                                                                               | #77                                                                                 | 259                                                                                 | 41                                                                                  | m258                                                                                | #885                                                                                |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 291                                                                               |                                                                                   |                                                                                   | 261                                                                               |                                                                                   |                                                                                     | 534                                                                                 |                                                                                     |                                                                                     | 378                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 150                                                                               |                                                                                   |                                                                                   | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                 |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 291                                                                               | 522                                                                               |                                                                                   | 259                                                                               | 484                                                                               | 878                                                                               | 69                                                                                  | 978                                                                                 | 474                                                                                 | 634                                                                                 | 2055                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 167                                                                                 |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.60                                                                              | 0.41                                                                              |                                                                                   | 1.12                                                                              | 0.41                                                                              | 0.77                                                                              | 0.54                                                                                | 0.64                                                                                | 0.22                                                                                | 0.79                                                                                | 1.12                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 76 (76%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 110

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.12

Intersection Signal Delay: 54.4

Intersection LOS: D

Intersection Capacity Utilization 105.0%

ICU Level of Service G

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Divide Ave & Bismarck Expy



|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |                                                                                   |  |                                                                                   |                                                                                   |                                                                                   |                                                                                    |  |  |  |  |  |
| Volume (vph)            | 188                                                                               | 0                                                                                 | 764                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 926                                                                                 | 135                                                                                 | 39                                                                                  | 1528                                                                                | 0                                                                                   |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                 | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 200                                                                               |                                                                                   | 200                                                                               | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  |                                                                                     | 0                                                                                   | 222                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 2                                                                                 |                                                                                   | 2                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 300                                                                               | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                 |                                                                                     | 25                                                                                  | 150                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                    |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                    | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 575                                                                               |                                                                                   |                                                                                   | 383                                                                               |                                                                                   |                                                                                    | 458                                                                                 |                                                                                     |                                                                                     | 769                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 13.1                                                                              |                                                                                   |                                                                                   | 8.7                                                                               |                                                                                   |                                                                                    | 7.8                                                                                 |                                                                                     |                                                                                     | 13.1                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                               | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                               | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 3%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                 | 8%                                                                                  | 27%                                                                                 | 10%                                                                                 | 9%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 204                                                                               | 0                                                                                 | 830                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 1007                                                                                | 147                                                                                 | 42                                                                                  | 1661                                                                                | 0                                                                                   |
| Turn Type               | custom                                                                            |                                                                                   | custom                                                                            |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     | Perm                                                                                | Perm                                                                                |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     | 6                                                                                   | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                   | 6                                                                                   | 2                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               |                                                                                   | 6.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 21.1                                                                              |                                                                                   | 21.1                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 23.4                                                                                | 23.4                                                                                | 21.4                                                                                | 21.4                                                                                |                                                                                     |
| Total Split (s)         | 37.9                                                                              | 0.0                                                                               | 37.9                                                                              | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 62.1                                                                                | 62.1                                                                                | 62.1                                                                                | 62.1                                                                                | 0.0                                                                                 |
| Total Split (%)         | 37.9%                                                                             | 0.0%                                                                              | 37.9%                                                                             | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                               | 62.1%                                                                               | 62.1%                                                                               | 62.1%                                                                               | 62.1%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.6                                                                               |                                                                                   | 3.6                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 1.5                                                                               |                                                                                   | 1.5                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 1.5                                                                                 | 1.5                                                                                 | 1.5                                                                                 | 1.5                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 5.1                                                                               | 4.0                                                                               | 5.1                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                                | 5.4                                                                                 | 5.4                                                                                 | 5.4                                                                                 | 5.4                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Recall Mode             | None                                                                              |                                                                                   | None                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               |                                                                                     |
| Act Effct Green (s)     | 31.6                                                                              |                                                                                   | 31.6                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 57.9                                                                                | 57.9                                                                                | 57.9                                                                                | 57.9                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.32                                                                              |                                                                                   | 0.32                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.58                                                                                | 0.58                                                                                | 0.58                                                                                | 0.58                                                                                |                                                                                     |
| v/c Ratio               | 0.19                                                                              |                                                                                   | 0.92                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.52                                                                                | 0.18                                                                                | 0.19                                                                                | 0.87                                                                                |                                                                                     |
| Control Delay           | 25.1                                                                              |                                                                                   | 47.6                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 13.3                                                                                | 3.1                                                                                 | 3.2                                                                                 | 9.3                                                                                 |                                                                                     |
| Queue Delay             | 0.0                                                                               |                                                                                   | 4.5                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.2                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 19.7                                                                                |                                                                                     |
| Total Delay             | 25.1                                                                              |                                                                                   | 52.1                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 13.5                                                                                | 3.1                                                                                 | 3.2                                                                                 | 29.0                                                                                |                                                                                     |
| LOS                     | C                                                                                 |                                                                                   | D                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | B                                                                                   | A                                                                                   | A                                                                                   | C                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 12.1                                                                                |                                                                                     |                                                                                     | 28.4                                                                                |                                                                                     |
| Approach LOS            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | B                                                                                   |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 47                                                                                |                                                                                   | 272                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 177                                                                                 | 9                                                                                   | 4                                                                                   | 428                                                                                 |                                                                                     |
| Queue Length 95th (ft)  | 75                                                                                |                                                                                   | #396                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 194                                                                                 | m15                                                                                 | m4                                                                                  | m226                                                                                |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 495                                                                               |                                                                                   |                                                                                   | 303                                                                               |                                                                                   |                                                                                    | 378                                                                                 |                                                                                     |                                                                                     | 689                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 200                                                                               |                                                                                   | 200                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | 222                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 1115                                                                              |                                                                                   | 938                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 1937                                                                                | 799                                                                                 | 226                                                                                 | 1919                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 259                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 |                                                                                   | 65                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 309                                                                                 |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.18                                                                              |                                                                                   | 0.95                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.60                                                                                | 0.18                                                                                | 0.19                                                                                | 1.03                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 52 (52%), Referenced to phase 2:SBTL and 6:NBT, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.92

Intersection Signal Delay: 28.4

Intersection LOS: C

Intersection Capacity Utilization 106.4%

ICU Level of Service G

Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: South Ramp & Centennial Rd

|                                                                                        |                                                                                         |
|----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
|  Ø2 |  Ø4 |
| 62.1 s                                                                                 | 37.9 s                                                                                  |
|  Ø6 |                                                                                         |
| 62.1 s                                                                                 |                                                                                         |

|                         |  |      |      |                                                                                   |      |                                                                                     |                                                                                     |                                                                                     |      |      |                                                                                     |                                                                                     |
|-------------------------|------------------------------------------------------------------------------------|------|------|-----------------------------------------------------------------------------------|------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------|------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                                | EBT  | EBR  | WBL                                                                               | WBT  | WBR                                                                                 | NBL                                                                                 | NBT                                                                                 | NBR  | SBL  | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |                                                                                    |      |      |  |      |  |  |  |      |      |  |  |
| Volume (vph)            | 0                                                                                  | 0    | 0    | 193                                                                               | 0    | 19                                                                                  | 447                                                                                 | 573                                                                                 | 0    | 0    | 2128                                                                                | 475                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                               | 1900 | 1900 | 1900                                                                              | 1900 | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900 | 1900 | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                 | 12   | 12   | 16                                                                                | 12   | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12   | 12   | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                    | 0%   |      |                                                                                   | 0%   |                                                                                     |                                                                                     | 0%                                                                                  |      |      | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 0                                                                                  |      | 0    | 0                                                                                 |      | 150                                                                                 | 215                                                                                 |                                                                                     | 0    | 0    |                                                                                     | 200                                                                                 |
| Storage Lanes           | 0                                                                                  |      | 0    | 1                                                                                 |      | 1                                                                                   | 1                                                                                   |                                                                                     | 0    | 0    |                                                                                     | 1                                                                                   |
| Taper Length (ft)       | 25                                                                                 |      | 25   | 25                                                                                |      | 100                                                                                 | 150                                                                                 |                                                                                     | 25   | 25   |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                    |      | Yes  |                                                                                   |      | Yes                                                                                 |                                                                                     |                                                                                     | Yes  |      |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                    | 30   |      |                                                                                   | 30   |                                                                                     |                                                                                     | 40                                                                                  |      |      | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                    | 270  |      |                                                                                   | 465  |                                                                                     |                                                                                     | 769                                                                                 |      |      | 782                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                    | 6.1  |      |                                                                                   | 10.6 |                                                                                     |                                                                                     | 13.1                                                                                |      |      | 13.3                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     |                                                                                     |      |      |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     |                                                                                     |      |      |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                               | 0.92 | 0.92 | 0.92                                                                              | 0.92 | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92 | 0.92 | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                               | 100% | 100% | 100%                                                                              | 100% | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100% | 100% | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                 | 2%   | 2%   | 12%                                                                               | 2%   | 8%                                                                                  | 6%                                                                                  | 3%                                                                                  | 2%   | 2%   | 3%                                                                                  | 1%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                  | 0    | 0    | 0                                                                                 | 0    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0    | 0    | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     |                                                                                     |      |      |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                    | 0%   |      |                                                                                   | 0%   |                                                                                     |                                                                                     | 0%                                                                                  |      |      | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     |                                                                                     |      |      |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 0                                                                                  | 0    | 0    | 210                                                                               | 0    | 21                                                                                  | 486                                                                                 | 623                                                                                 | 0    | 0    | 2313                                                                                | 516                                                                                 |
| Turn Type               |                                                                                    |      |      | custom                                                                            |      | custom                                                                              | pm+pt                                                                               |                                                                                     |      |      |                                                                                     | Perm                                                                                |
| Protected Phases        |                                                                                    |      |      |                                                                                   |      |                                                                                     | 1                                                                                   | 6                                                                                   |      |      | 2                                                                                   |                                                                                     |
| Permitted Phases        |                                                                                    |      |      | 8                                                                                 |      | 8                                                                                   | 6                                                                                   |                                                                                     |      |      |                                                                                     | 2                                                                                   |
| Detector Phase          |                                                                                    |      |      | 8                                                                                 |      | 8                                                                                   | 1                                                                                   | 6                                                                                   |      |      | 2                                                                                   | 2                                                                                   |
| Switch Phase            |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     |                                                                                     |      |      |                                                                                     |                                                                                     |
| Minimum Initial (s)     |                                                                                    |      |      | 5.0                                                                               |      | 5.0                                                                                 | 5.0                                                                                 | 10.0                                                                                |      |      | 10.0                                                                                | 10.0                                                                                |
| Minimum Split (s)       |                                                                                    |      |      | 20.0                                                                              |      | 20.0                                                                                | 9.0                                                                                 | 20.0                                                                                |      |      | 22.4                                                                                | 22.4                                                                                |
| Total Split (s)         | 0.0                                                                                | 0.0  | 0.0  | 20.0                                                                              | 0.0  | 20.0                                                                                | 20.0                                                                                | 80.0                                                                                | 0.0  | 0.0  | 60.0                                                                                | 60.0                                                                                |
| Total Split (%)         | 0.0%                                                                               | 0.0% | 0.0% | 20.0%                                                                             | 0.0% | 20.0%                                                                               | 20.0%                                                                               | 80.0%                                                                               | 0.0% | 0.0% | 60.0%                                                                               | 60.0%                                                                               |
| Yellow Time (s)         |                                                                                    |      |      | 3.2                                                                               |      | 3.2                                                                                 | 3.0                                                                                 | 3.9                                                                                 |      |      | 3.9                                                                                 | 3.9                                                                                 |
| All-Red Time (s)        |                                                                                    |      |      | 2.0                                                                               |      | 2.0                                                                                 | 1.0                                                                                 | 1.5                                                                                 |      |      | 1.5                                                                                 | 1.5                                                                                 |
| Lost Time Adjust (s)    | 0.0                                                                                | 0.0  | 0.0  | 0.0                                                                               | 0.0  | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0  | 0.0  | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                                | 4.0  | 4.0  | 5.2                                                                               | 4.0  | 5.2                                                                                 | 4.0                                                                                 | 5.4                                                                                 | 4.0  | 4.0  | 5.4                                                                                 | 5.4                                                                                 |
| Lead/Lag                |                                                                                    |      |      |                                                                                   |      |                                                                                     | Lead                                                                                |                                                                                     |      |      | Lag                                                                                 | Lag                                                                                 |
| Lead-Lag Optimize?      |                                                                                    |      |      |                                                                                   |      |                                                                                     | Yes                                                                                 |                                                                                     |      |      | Yes                                                                                 | Yes                                                                                 |
| Recall Mode             |                                                                                    |      |      | None                                                                              |      | None                                                                                | None                                                                                | C-Min                                                                               |      |      | C-Min                                                                               | C-Min                                                                               |
| Act Effect Green (s)    |                                                                                    |      |      | 13.8                                                                              |      | 13.8                                                                                | 77.0                                                                                | 75.6                                                                                |      |      | 54.6                                                                                | 54.6                                                                                |
| Actuated g/C Ratio      |                                                                                    |      |      | 0.14                                                                              |      | 0.14                                                                                | 0.77                                                                                | 0.76                                                                                |      |      | 0.55                                                                                | 0.55                                                                                |
| v/c Ratio               |                                                                                    |      |      | 0.83                                                                              |      | 0.09                                                                                | 1.34                                                                                | 0.24                                                                                |      |      | 1.21                                                                                | 0.51                                                                                |
| Control Delay           |                                                                                    |      |      | 69.3                                                                              |      | 16.1                                                                                | 195.0                                                                               | 3.8                                                                                 |      |      | 118.8                                                                               | 4.6                                                                                 |
| Queue Delay             |                                                                                    |      |      | 0.0                                                                               |      | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |      |      | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             |                                                                                    |      |      | 69.3                                                                              |      | 16.1                                                                                | 195.0                                                                               | 3.8                                                                                 |      |      | 118.8                                                                               | 4.6                                                                                 |
| LOS                     |                                                                                    |      |      | E                                                                                 |      | B                                                                                   | F                                                                                   | A                                                                                   |      |      | F                                                                                   | A                                                                                   |
| Approach Delay          |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     | 87.6                                                                                |      |      | 98.0                                                                                |                                                                                     |
| Approach LOS            |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     | F                                                                                   |      |      | F                                                                                   |                                                                                     |
| Queue Length 50th (ft)  |                                                                                    |      |      | 130                                                                               |      | 0                                                                                   | ~382                                                                                | 51                                                                                  |      |      | ~985                                                                                | 47                                                                                  |
| Queue Length 95th (ft)  |                                                                                    |      |      | #244                                                                              |      | 22                                                                                  | #582                                                                                | 68                                                                                  |      |      | m#1091                                                                              | m67                                                                                 |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 190                                                                               |                                                                                   |                                                                                   | 385                                                                               |                                                                                   |                                                                                    | 689                                                                                 |                                                                                     |                                                                                     | 702                                                                                 |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 150                                                                               | 215                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     | 200                                                                                 |
| Base Capacity (vph)     |                                                                                   |                                                                                   |                                                                                   | 270                                                                               |                                                                                   | 239                                                                               | 363                                                                                | 2651                                                                                |                                                                                     |                                                                                     | 1914                                                                                | 1011                                                                                |
| Starvation Cap Reductn  |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     |                                                                                     | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     |                                                                                     | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     |                                                                                     | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       |                                                                                   |                                                                                   |                                                                                   | 0.78                                                                              |                                                                                   | 0.09                                                                              | 1.34                                                                               | 0.24                                                                                |                                                                                     |                                                                                     | 1.21                                                                                | 0.51                                                                                |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 28 (28%), Referenced to phase 2:SBT and 6:NBTL, Start of Green

Natural Cycle: 150

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.34

Intersection Signal Delay: 93.3

Intersection LOS: F

Intersection Capacity Utilization 106.4%

ICU Level of Service G

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: North Ramp & Centennial Rd



|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |                                                                                   |  |  |  |  |                                                                                   |  |  |                                                                                     |  |  |                                                                                     |
| Volume (vph)            | 14                                                                                | 2                                                                                 | 423                                                                               | 177                                                                               | 9                                                                                 | 79                                                                                | 107                                                                                 | 595                                                                                 | 140                                                                                 | 22                                                                                  | 1755                                                                                | 29                                                                                  |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 0                                                                                 |                                                                                   | 200                                                                               | 200                                                                               |                                                                                   | 200                                                                               | 530                                                                                 |                                                                                     | 0                                                                                   | 215                                                                                 |                                                                                     | 150                                                                                 |
| Storage Lanes           | 0                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                   |                                                                                     | 0                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                  |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 632                                                                               |                                                                                   |                                                                                   | 937                                                                               |                                                                                   |                                                                                     | 782                                                                                 |                                                                                     |                                                                                     | 1308                                                                                |                                                                                     |
| Travel Time (s)         |                                                                                   | 14.4                                                                              |                                                                                   |                                                                                   | 21.3                                                                              |                                                                                   |                                                                                     | 13.3                                                                                |                                                                                     |                                                                                     | 22.3                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 0                                                                                 | 17                                                                                | 460                                                                               | 192                                                                               | 96                                                                                | 0                                                                                 | 116                                                                                 | 799                                                                                 | 0                                                                                   | 24                                                                                  | 1940                                                                                | 0                                                                                   |
| Turn Type               | Perm                                                                              |                                                                                   | Perm                                                                              | Perm                                                                              |                                                                                   |                                                                                   | pm+pt                                                                               |                                                                                     |                                                                                     | Perm                                                                                |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 | 8                                                                                 |                                                                                   |                                                                                   | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 | 4                                                                                 | 4                                                                                 | 8                                                                                 | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     | 2                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               |                                                                                   | 5.0                                                                                 | 4.0                                                                                 |                                                                                     | 4.0                                                                                 | 4.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              |                                                                                   | 9.0                                                                                 | 20.0                                                                                |                                                                                     | 20.0                                                                                | 20.0                                                                                |                                                                                     |
| Total Split (s)         | 23.0                                                                              | 23.0                                                                              | 23.0                                                                              | 23.0                                                                              | 23.0                                                                              | 0.0                                                                               | 12.0                                                                                | 77.0                                                                                | 0.0                                                                                 | 65.0                                                                                | 65.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 23.0%                                                                             | 23.0%                                                                             | 23.0%                                                                             | 23.0%                                                                             | 23.0%                                                                             | 0.0%                                                                              | 12.0%                                                                               | 77.0%                                                                               | 0.0%                                                                                | 65.0%                                                                               | 65.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               |                                                                                   | 3.5                                                                                 | 3.5                                                                                 |                                                                                     | 3.5                                                                                 | 3.5                                                                                 |                                                                                     |
| All-Red Time (s)        | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               |                                                                                   | 0.5                                                                                 | 0.5                                                                                 |                                                                                     | 0.5                                                                                 | 0.5                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lag                                                                                 |                                                                                     |                                                                                     | Lead                                                                                | Lead                                                                                |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 | Yes                                                                                 |                                                                                     |
| Recall Mode             | None                                                                              | None                                                                              | None                                                                              | None                                                                              | None                                                                              |                                                                                   | None                                                                                | C-Min                                                                               |                                                                                     | C-Min                                                                               | C-Min                                                                               |                                                                                     |
| Act Effct Green (s)     |                                                                                   | 20.4                                                                              | 20.4                                                                              | 20.4                                                                              | 20.4                                                                              |                                                                                   | 71.6                                                                                | 71.6                                                                                |                                                                                     | 60.7                                                                                | 60.7                                                                                |                                                                                     |
| Actuated g/C Ratio      |                                                                                   | 0.20                                                                              | 0.20                                                                              | 0.20                                                                              | 0.20                                                                              |                                                                                   | 0.72                                                                                | 0.72                                                                                |                                                                                     | 0.61                                                                                | 0.61                                                                                |                                                                                     |
| v/c Ratio               |                                                                                   | 0.05                                                                              | 1.06                                                                              | 0.68                                                                              | 0.24                                                                              |                                                                                   | 0.59                                                                                | 0.32                                                                                |                                                                                     | 0.07                                                                                | 0.90                                                                                |                                                                                     |
| Control Delay           |                                                                                   | 33.8                                                                              | 87.9                                                                              | 50.9                                                                              | 11.1                                                                              |                                                                                   | 46.4                                                                                | 8.4                                                                                 |                                                                                     | 3.7                                                                                 | 13.7                                                                                |                                                                                     |
| Queue Delay             |                                                                                   | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                                 | 0.0                                                                                 |                                                                                     | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |
| Total Delay             |                                                                                   | 33.8                                                                              | 87.9                                                                              | 50.9                                                                              | 11.1                                                                              |                                                                                   | 46.4                                                                                | 8.4                                                                                 |                                                                                     | 3.7                                                                                 | 13.7                                                                                |                                                                                     |
| LOS                     |                                                                                   | C                                                                                 | F                                                                                 | D                                                                                 | B                                                                                 |                                                                                   | D                                                                                   | A                                                                                   |                                                                                     | A                                                                                   | B                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 85.9                                                                              |                                                                                   |                                                                                   | 37.6                                                                              |                                                                                   |                                                                                     | 13.2                                                                                |                                                                                     |                                                                                     | 13.6                                                                                |                                                                                     |
| Approach LOS            |                                                                                   | F                                                                                 |                                                                                   |                                                                                   | D                                                                                 |                                                                                   |                                                                                     | B                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| Queue Length 50th (ft)  |                                                                                   | 9                                                                                 | ~255                                                                              | 115                                                                               | 5                                                                                 |                                                                                   | 30                                                                                  | 107                                                                                 |                                                                                     | 4                                                                                   | 530                                                                                 |                                                                                     |
| Queue Length 95th (ft)  |                                                                                   | 28                                                                                | #457                                                                              | #219                                                                              | 49                                                                                |                                                                                   | 88                                                                                  | 124                                                                                 |                                                                                     | m3                                                                                  | m235                                                                                |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 552                                                                               |                                                                                   |                                                                                   | 857                                                                               |                                                                                   |                                                                                    | 702                                                                                 |                                                                                     |                                                                                     | 1228                                                                                |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   | 200                                                                               | 200                                                                               |                                                                                   |                                                                                   | 530                                                                                |                                                                                     |                                                                                     | 215                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     |                                                                                   | 310                                                                               | 435                                                                               | 284                                                                               | 398                                                                               |                                                                                   | 216                                                                                | 2529                                                                                |                                                                                     | 367                                                                                 | 2156                                                                                |                                                                                     |
| Starvation Cap Reductn  |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       |                                                                                   | 0.05                                                                              | 1.06                                                                              | 0.68                                                                              | 0.24                                                                              |                                                                                   | 0.54                                                                               | 0.32                                                                                |                                                                                     | 0.07                                                                                | 0.90                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 4 (4%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.06

Intersection Signal Delay: 24.9

Intersection LOS: C

Intersection Capacity Utilization 95.4%

ICU Level of Service F

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Trenton Dr & Centennial Rd



|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |  |  |  |  |  |  |                                                                                     |  |  |  |
| Volume (vph)            | 47                                                                                | 64                                                                                | 415                                                                               | 1147                                                                              | 475                                                                               | 62                                                                                | 182                                                                                 | 399                                                                                 | 38                                                                                  | 44                                                                                  | 1921                                                                                | 173                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                                 |                                                                                     | 0                                                                                   | 215                                                                                 |                                                                                     | 215                                                                                 |
| Storage Lanes           | 1                                                                                 |                                                                                   | 1                                                                                 | 2                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                   |                                                                                     | 0                                                                                   | 1                                                                                   |                                                                                     | 1                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                  |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 35                                                                                |                                                                                   |                                                                                   | 35                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 505                                                                               |                                                                                   |                                                                                   | 579                                                                               |                                                                                   |                                                                                     | 1308                                                                                |                                                                                     |                                                                                     | 512                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 9.8                                                                               |                                                                                   |                                                                                   | 11.3                                                                              |                                                                                   |                                                                                     | 22.3                                                                                |                                                                                     |                                                                                     | 8.7                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 51                                                                                | 70                                                                                | 451                                                                               | 1247                                                                              | 516                                                                               | 67                                                                                | 198                                                                                 | 475                                                                                 | 0                                                                                   | 48                                                                                  | 2088                                                                                | 188                                                                                 |
| Turn Type               | pm+pt                                                                             |                                                                                   | Perm                                                                              | pm+pt                                                                             |                                                                                   | Perm                                                                              | pm+pt                                                                               |                                                                                     |                                                                                     | pm+pt                                                                               |                                                                                     | Perm                                                                                |
| Protected Phases        | 7                                                                                 | 4                                                                                 |                                                                                   | 3                                                                                 | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     | 2                                                                                   |
| Detector Phase          | 7                                                                                 | 4                                                                                 | 4                                                                                 | 3                                                                                 | 8                                                                                 | 8                                                                                 | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   | 2                                                                                   |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 4.0                                                                               | 10.0                                                                              | 10.0                                                                              | 4.0                                                                               | 10.0                                                                              | 10.0                                                                              | 4.0                                                                                 | 6.0                                                                                 |                                                                                     | 4.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 |
| Minimum Split (s)       | 8.0                                                                               | 15.7                                                                              | 15.7                                                                              | 8.0                                                                               | 15.7                                                                              | 15.7                                                                              | 8.0                                                                                 | 11.5                                                                                |                                                                                     | 8.0                                                                                 | 11.5                                                                                | 11.5                                                                                |
| Total Split (s)         | 12.0                                                                              | 23.0                                                                              | 23.0                                                                              | 22.0                                                                              | 33.0                                                                              | 33.0                                                                              | 12.0                                                                                | 43.0                                                                                | 0.0                                                                                 | 12.0                                                                                | 43.0                                                                                | 43.0                                                                                |
| Total Split (%)         | 12.0%                                                                             | 23.0%                                                                             | 23.0%                                                                             | 22.0%                                                                             | 33.0%                                                                             | 33.0%                                                                             | 12.0%                                                                               | 43.0%                                                                               | 0.0%                                                                                | 12.0%                                                                               | 43.0%                                                                               | 43.0%                                                                               |
| Yellow Time (s)         | 3.5                                                                               | 3.9                                                                               | 3.9                                                                               | 3.5                                                                               | 3.9                                                                               | 3.9                                                                               | 3.5                                                                                 | 3.6                                                                                 |                                                                                     | 3.5                                                                                 | 3.6                                                                                 | 3.6                                                                                 |
| All-Red Time (s)        | 0.5                                                                               | 1.8                                                                               | 1.8                                                                               | 0.5                                                                               | 1.8                                                                               | 1.8                                                                               | 0.5                                                                                 | 1.9                                                                                 |                                                                                     | 0.5                                                                                 | 1.9                                                                                 | 1.9                                                                                 |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 5.7                                                                               | 5.7                                                                               | 4.0                                                                               | 5.7                                                                               | 5.7                                                                               | 4.0                                                                                 | 5.5                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 5.5                                                                                 | 5.5                                                                                 |
| Lead/Lag                | Lag                                                                               | Lag                                                                               | Lag                                                                               | Lead                                                                              | Lead                                                                              | Lead                                                                              | Lead                                                                                | Lead                                                                                |                                                                                     | Lag                                                                                 | Lag                                                                                 | Lag                                                                                 |
| Lead-Lag Optimize?      | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                                 | Yes                                                                                 |                                                                                     | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 |
| Recall Mode             | None                                                                              | Max                                                                               | Max                                                                               | None                                                                              | Max                                                                               | Max                                                                               | None                                                                                | C-Max                                                                               |                                                                                     | None                                                                                | C-Max                                                                               | C-Max                                                                               |
| Act Effect Green (s)    | 19.0                                                                              | 17.3                                                                              | 17.3                                                                              | 31.4                                                                              | 29.7                                                                              | 29.7                                                                              | 43.8                                                                                | 42.3                                                                                |                                                                                     | 39.0                                                                                | 37.5                                                                                | 37.5                                                                                |
| Actuated g/C Ratio      | 0.19                                                                              | 0.17                                                                              | 0.17                                                                              | 0.31                                                                              | 0.30                                                                              | 0.30                                                                              | 0.44                                                                                | 0.42                                                                                |                                                                                     | 0.39                                                                                | 0.38                                                                                | 0.38                                                                                |
| v/c Ratio               | 0.22                                                                              | 0.11                                                                              | 1.13                                                                              | 1.48                                                                              | 0.49                                                                              | 0.13                                                                              | 0.88                                                                                | 0.32                                                                                |                                                                                     | 0.12                                                                                | 1.57                                                                                | 0.29                                                                                |
| Control Delay           | 38.3                                                                              | 35.5                                                                              | 112.4                                                                             | 248.6                                                                             | 31.7                                                                              | 7.8                                                                               | 57.5                                                                                | 18.2                                                                                |                                                                                     | 20.9                                                                                | 288.2                                                                               | 12.1                                                                                |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 |                                                                                     | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             | 38.3                                                                              | 35.5                                                                              | 112.4                                                                             | 248.6                                                                             | 31.7                                                                              | 7.8                                                                               | 57.5                                                                                | 18.2                                                                                |                                                                                     | 20.9                                                                                | 288.2                                                                               | 12.1                                                                                |
| LOS                     | D                                                                                 | D                                                                                 | F                                                                                 | F                                                                                 | C                                                                                 | A                                                                                 | E                                                                                   | B                                                                                   |                                                                                     | C                                                                                   | F                                                                                   | B                                                                                   |
| Approach Delay          |                                                                                   | 96.4                                                                              |                                                                                   |                                                                                   | 178.6                                                                             |                                                                                   |                                                                                     | 29.8                                                                                |                                                                                     |                                                                                     | 260.4                                                                               |                                                                                     |
| Approach LOS            |                                                                                   | F                                                                                 |                                                                                   |                                                                                   | F                                                                                 |                                                                                   |                                                                                     | C                                                                                   |                                                                                     |                                                                                     | F                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 27                                                                                | 20                                                                                | ~250                                                                              | ~514                                                                              | 147                                                                               | 0                                                                                 | 104                                                                                 | 132                                                                                 |                                                                                     | 19                                                                                  | ~1000                                                                               | 39                                                                                  |
| Queue Length 95th (ft)  | 61                                                                                | 40                                                                                | #446                                                                              | #643                                                                              | 200                                                                               | 32                                                                                | #217                                                                                | 181                                                                                 |                                                                                     | 42                                                                                  | #1138                                                                               | 89                                                                                  |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 425                                                                               |                                                                                   |                                                                                   | 499                                                                               |                                                                                   |                                                                                    | 1228                                                                                |                                                                                     |                                                                                     | 432                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                                |                                                                                     |                                                                                     | 215                                                                                 |                                                                                     | 215                                                                                 |
| Base Capacity (vph)     | 236                                                                               | 612                                                                               | 399                                                                               | 844                                                                               | 1051                                                                              | 517                                                                               | 225                                                                                | 1484                                                                                |                                                                                     | 419                                                                                 | 1327                                                                                | 653                                                                                 |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       | 0.22                                                                              | 0.11                                                                              | 1.13                                                                              | 1.48                                                                              | 0.49                                                                              | 0.13                                                                              | 0.88                                                                               | 0.32                                                                                |                                                                                     | 0.11                                                                                | 1.57                                                                                | 0.29                                                                                |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 63 (63%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 150

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.57

Intersection Signal Delay: 186.6

Intersection LOS: F

Intersection Capacity Utilization 124.2%

ICU Level of Service H

Analysis Period (min) 15

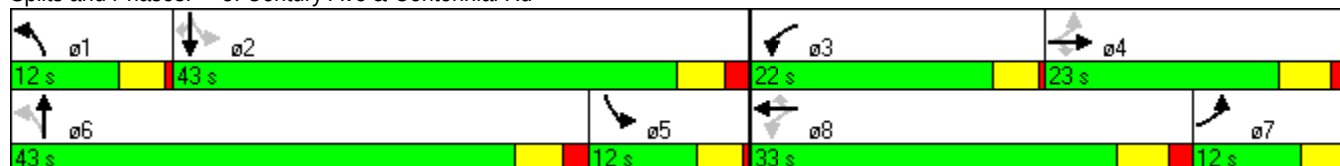
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 5: Century Ave & Centennial Rd





**Appendix AA: 2059 - Signal at Trenton PM (4B2)**

Exit 161 Operational Study  
Bismarck, ND

1: Divide Ave & Bismarck Expy

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |                                                                                   |  |  |  |  |  |  |  |  |  |
| Volume (vph)            | 408                                                                               | 80                                                                                | 35                                                                                | 213                                                                               | 174                                                                               | 778                                                                               | 32                                                                                  | 1148                                                                                | 81                                                                                  | 291                                                                                 | 1240                                                                                | 188                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 150                                                                               |                                                                                   | 0                                                                                 | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                 |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                   |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 100                                                                               |                                                                                   | 25                                                                                | 100                                                                               |                                                                                   | 100                                                                               | 100                                                                                 |                                                                                     | 150                                                                                 | 100                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 25                                                                                |                                                                                   |                                                                                   | 25                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 371                                                                               |                                                                                   |                                                                                   | 341                                                                               |                                                                                   |                                                                                     | 614                                                                                 |                                                                                     |                                                                                     | 458                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 10.1                                                                              |                                                                                   |                                                                                   | 9.3                                                                               |                                                                                   |                                                                                     | 10.5                                                                                |                                                                                     |                                                                                     | 7.8                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 4%                                                                                | 1%                                                                                | 1%                                                                                | 11%                                                                               | 10%                                                                               | 22%                                                                               | 10%                                                                                 | 7%                                                                                  | 17%                                                                                 | 11%                                                                                 | 4%                                                                                  | 4%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 443                                                                               | 125                                                                               | 0                                                                                 | 232                                                                               | 189                                                                               | 846                                                                               | 35                                                                                  | 1248                                                                                | 88                                                                                  | 316                                                                                 | 1552                                                                                | 0                                                                                   |
| Turn Type               | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                              |                                                                                   | pm+ov                                                                             | Perm                                                                                |                                                                                     | Perm                                                                                | pm+pt                                                                               |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 | 5                                                                                 |                                                                                     | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                   |                                                                                     | 6                                                                                   | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 | 4                                                                                 |                                                                                   | 8                                                                                 | 8                                                                                 | 5                                                                                 | 6                                                                                   | 6                                                                                   | 6                                                                                   | 5                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               | 6.0                                                                               |                                                                                   | 6.0                                                                               | 6.0                                                                               | 5.0                                                                               | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 5.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 30.0                                                                              | 30.0                                                                              |                                                                                   | 30.0                                                                              | 30.0                                                                              | 9.8                                                                               | 22.9                                                                                | 22.9                                                                                | 22.9                                                                                | 9.8                                                                                 | 28.7                                                                                |                                                                                     |
| Total Split (s)         | 40.0                                                                              | 40.0                                                                              | 0.0                                                                               | 40.0                                                                              | 40.0                                                                              | 21.0                                                                              | 39.0                                                                                | 39.0                                                                                | 39.0                                                                                | 21.0                                                                                | 60.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 40.0%                                                                             | 40.0%                                                                             | 0.0%                                                                              | 40.0%                                                                             | 40.0%                                                                             | 21.0%                                                                             | 39.0%                                                                               | 39.0%                                                                               | 39.0%                                                                               | 21.0%                                                                               | 60.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 3.0                                                                               | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 | 3.0                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 1.0                                                                               | 1.8                                                                                 | 1.8                                                                                 | 1.8                                                                                 | 1.0                                                                                 | 1.8                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 5.7                                                                                 | 5.7                                                                                 | 5.7                                                                                 | 4.0                                                                                 | 5.7                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lag                                                                               | Lead                                                                                | Lead                                                                                | Lead                                                                                | Lag                                                                                 |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                               | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 |                                                                                     |                                                                                     |
| Recall Mode             | None                                                                              | None                                                                              |                                                                                   | None                                                                              | None                                                                              | None                                                                              | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               | None                                                                                | C-Min                                                                               |                                                                                     |
| Act Effct Green (s)     | 34.0                                                                              | 34.0                                                                              |                                                                                   | 34.0                                                                              | 34.0                                                                              | 57.0                                                                              | 33.3                                                                                | 33.3                                                                                | 33.3                                                                                | 56.0                                                                                | 54.3                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.34                                                                              | 0.34                                                                              |                                                                                   | 0.34                                                                              | 0.34                                                                              | 0.57                                                                              | 0.33                                                                                | 0.33                                                                                | 0.33                                                                                | 0.56                                                                                | 0.54                                                                                |                                                                                     |
| v/c Ratio               | 1.18                                                                              | 0.20                                                                              |                                                                                   | 0.59                                                                              | 0.32                                                                              | 1.12                                                                              | 0.51                                                                                | 1.11                                                                                | 0.17                                                                                | 0.92                                                                                | 0.83                                                                                |                                                                                     |
| Control Delay           | 136.5                                                                             | 19.8                                                                              |                                                                                   | 34.6                                                                              | 26.4                                                                              | 93.3                                                                              | 56.3                                                                                | 95.2                                                                                | 9.9                                                                                 | 65.1                                                                                | 22.2                                                                                |                                                                                     |
| Queue Delay             | 12.3                                                                              | 0.0                                                                               |                                                                                   | 0.0                                                                               | 0.0                                                                               | 10.2                                                                              | 0.0                                                                                 | 6.4                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 1.2                                                                                 |                                                                                     |
| Total Delay             | 148.8                                                                             | 19.8                                                                              |                                                                                   | 34.6                                                                              | 26.4                                                                              | 103.5                                                                             | 56.3                                                                                | 101.6                                                                               | 9.9                                                                                 | 65.1                                                                                | 23.4                                                                                |                                                                                     |
| LOS                     | F                                                                                 | B                                                                                 |                                                                                   | C                                                                                 | C                                                                                 | F                                                                                 | E                                                                                   | F                                                                                   | A                                                                                   | E                                                                                   | C                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 120.4                                                                             |                                                                                   |                                                                                   | 79.3                                                                              |                                                                                   |                                                                                     | 94.5                                                                                |                                                                                     |                                                                                     | 30.5                                                                                |                                                                                     |
| Approach LOS            |                                                                                   | F                                                                                 |                                                                                   |                                                                                   | E                                                                                 |                                                                                   |                                                                                     | F                                                                                   |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | ~340                                                                              | 45                                                                                |                                                                                   | 121                                                                               | 89                                                                                | ~624                                                                              | 18                                                                                  | ~481                                                                                | 10                                                                                  | 167                                                                                 | 473                                                                                 |                                                                                     |
| Queue Length 95th (ft)  | #531                                                                              | 88                                                                                |                                                                                   | 204                                                                               | 147                                                                               | #861                                                                              | #66                                                                                 | #614                                                                                | 45                                                                                  | m#303                                                                               | 577                                                                                 |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 291                                                                               |                                                                                   |                                                                                   | 261                                                                               |                                                                                   |                                                                                    | 534                                                                                 |                                                                                     |                                                                                     | 378                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 150                                                                               |                                                                                   |                                                                                   | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 376                                                                               | 626                                                                               |                                                                                   | 394                                                                               | 587                                                                               | 757                                                                               | 69                                                                                 | 1124                                                                                | 503                                                                                 | 345                                                                                 | 1859                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 133                                                                                 |                                                                                     |
| Spillback Cap Reductn   | 9                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 16                                                                                | 0                                                                                  | 15                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 1.21                                                                              | 0.20                                                                              |                                                                                   | 0.59                                                                              | 0.32                                                                              | 1.14                                                                              | 0.51                                                                               | 1.13                                                                                | 0.17                                                                                | 0.92                                                                                | 0.90                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 9 (9%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.18

Intersection Signal Delay: 70.0

Intersection LOS: E

Intersection Capacity Utilization 115.6%

ICU Level of Service H

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

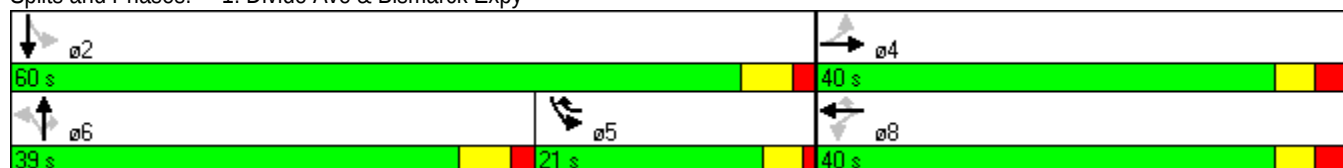
Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Divide Ave & Bismarck Expy



|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |                                                                                   |  |                                                                                   |                                                                                   |                                                                                   |                                                                                    |  |  |  |  |  |
| Volume (vph)            | 418                                                                               | 0                                                                                 | 561                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 1862                                                                                | 182                                                                                 | 46                                                                                  | 939                                                                                 | 0                                                                                   |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                 | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 200                                                                               |                                                                                   | 200                                                                               | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  |                                                                                     | 0                                                                                   | 222                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 2                                                                                 |                                                                                   | 2                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 300                                                                               | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                 |                                                                                     | 25                                                                                  | 150                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                    |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                    | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 575                                                                               |                                                                                   |                                                                                   | 383                                                                               |                                                                                   |                                                                                    | 458                                                                                 |                                                                                     |                                                                                     | 769                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 13.1                                                                              |                                                                                   |                                                                                   | 8.7                                                                               |                                                                                   |                                                                                    | 7.8                                                                                 |                                                                                     |                                                                                     | 13.1                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                               | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                               | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 3%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                 | 8%                                                                                  | 27%                                                                                 | 10%                                                                                 | 9%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 454                                                                               | 0                                                                                 | 610                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 2024                                                                                | 198                                                                                 | 50                                                                                  | 1021                                                                                | 0                                                                                   |
| Turn Type               | custom                                                                            |                                                                                   | custom                                                                            |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     | Perm                                                                                | Perm                                                                                |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     | 6                                                                                   | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                   | 6                                                                                   | 2                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               |                                                                                   | 6.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 21.1                                                                              |                                                                                   | 21.1                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 23.4                                                                                | 23.4                                                                                | 21.4                                                                                | 21.4                                                                                |                                                                                     |
| Total Split (s)         | 24.0                                                                              | 0.0                                                                               | 24.0                                                                              | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 76.0                                                                                | 76.0                                                                                | 76.0                                                                                | 76.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 24.0%                                                                             | 0.0%                                                                              | 24.0%                                                                             | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                               | 76.0%                                                                               | 76.0%                                                                               | 76.0%                                                                               | 76.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.6                                                                               |                                                                                   | 3.6                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 1.5                                                                               |                                                                                   | 1.5                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 1.5                                                                                 | 1.5                                                                                 | 1.5                                                                                 | 1.5                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 5.1                                                                               | 4.0                                                                               | 5.1                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                                | 5.4                                                                                 | 5.4                                                                                 | 5.4                                                                                 | 5.4                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Recall Mode             | None                                                                              |                                                                                   | None                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               |                                                                                     |
| Act Effect Green (s)    | 17.8                                                                              |                                                                                   | 17.8                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 71.7                                                                                | 71.7                                                                                | 71.7                                                                                | 71.7                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.18                                                                              |                                                                                   | 0.18                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.72                                                                                | 0.72                                                                                | 0.72                                                                                | 0.72                                                                                |                                                                                     |
| v/c Ratio               | 0.75                                                                              |                                                                                   | 0.83                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.84                                                                                | 0.20                                                                                | 0.72                                                                                | 0.43                                                                                |                                                                                     |
| Control Delay           | 47.4                                                                              |                                                                                   | 31.7                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 7.4                                                                                 | 0.1                                                                                 | 57.4                                                                                | 0.6                                                                                 |                                                                                     |
| Queue Delay             | 0.0                                                                               |                                                                                   | 0.6                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 14.1                                                                                | 0.0                                                                                 | 0.0                                                                                 | 0.1                                                                                 |                                                                                     |
| Total Delay             | 47.4                                                                              |                                                                                   | 32.3                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 21.6                                                                                | 0.1                                                                                 | 57.4                                                                                | 0.7                                                                                 |                                                                                     |
| LOS                     | D                                                                                 |                                                                                   | C                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | C                                                                                   | A                                                                                   | E                                                                                   | A                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 19.6                                                                                |                                                                                     |                                                                                     | 3.3                                                                                 |                                                                                     |
| Approach LOS            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | B                                                                                   |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 140                                                                               |                                                                                   | 113                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 323                                                                                 | 0                                                                                   | 13                                                                                  | 0                                                                                   |                                                                                     |
| Queue Length 95th (ft)  | 195                                                                               |                                                                                   | #193                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | m235                                                                                | m0                                                                                  | m#24                                                                                | 0                                                                                   |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 495                                                                               |                                                                                   |                                                                                   | 303                                                                               |                                                                                   |                                                                                    | 378                                                                                 |                                                                                     |                                                                                     | 689                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 200                                                                               |                                                                                   | 200                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | 222                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 643                                                                               |                                                                                   | 760                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 2398                                                                                | 968                                                                                 | 69                                                                                  | 2376                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 406                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 |                                                                                   | 23                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 273                                                                                 |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.71                                                                              |                                                                                   | 0.83                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 1.02                                                                                | 0.20                                                                                | 0.72                                                                                | 0.49                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 85 (85%), Referenced to phase 2:SBTL and 6:NBT, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.84

Intersection Signal Delay: 20.3

Intersection LOS: C

Intersection Capacity Utilization 81.6%

ICU Level of Service D

Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: South Ramp & Centennial Rd



|                         |  |      |      |                                                                                   |      |                                                                                     |                                                                                     |                                                                                     |      |      |                                                                                     |                                                                                     |
|-------------------------|------------------------------------------------------------------------------------|------|------|-----------------------------------------------------------------------------------|------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------|------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                                | EBT  | EBR  | WBL                                                                               | WBT  | WBR                                                                                 | NBL                                                                                 | NBT                                                                                 | NBR  | SBL  | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |                                                                                    |      |      |  |      |  |  |  |      |      |  |  |
| Volume (vph)            | 0                                                                                  | 0    | 0    | 210                                                                               | 0    | 45                                                                                  | 501                                                                                 | 1424                                                                                | 0    | 0    | 838                                                                                 | 233                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                               | 1900 | 1900 | 1900                                                                              | 1900 | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900 | 1900 | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                 | 12   | 12   | 16                                                                                | 12   | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12   | 12   | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                    | 0%   |      |                                                                                   | 0%   |                                                                                     |                                                                                     | 0%                                                                                  |      |      | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 0                                                                                  |      | 0    | 0                                                                                 |      | 150                                                                                 | 215                                                                                 |                                                                                     | 0    | 0    |                                                                                     | 200                                                                                 |
| Storage Lanes           | 0                                                                                  |      | 0    | 1                                                                                 |      | 1                                                                                   | 1                                                                                   |                                                                                     | 0    | 0    |                                                                                     | 1                                                                                   |
| Taper Length (ft)       | 25                                                                                 |      | 25   | 25                                                                                |      | 100                                                                                 | 150                                                                                 |                                                                                     | 25   | 25   |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                    |      | Yes  |                                                                                   |      | Yes                                                                                 |                                                                                     |                                                                                     | Yes  |      |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                    | 30   |      |                                                                                   | 30   |                                                                                     |                                                                                     | 40                                                                                  |      |      | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                    | 270  |      |                                                                                   | 465  |                                                                                     |                                                                                     | 769                                                                                 |      |      | 788                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                    | 6.1  |      |                                                                                   | 10.6 |                                                                                     |                                                                                     | 13.1                                                                                |      |      | 13.4                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     |                                                                                     |      |      |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     |                                                                                     |      |      |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                               | 0.92 | 0.92 | 0.92                                                                              | 0.92 | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92 | 0.92 | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                               | 100% | 100% | 100%                                                                              | 100% | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100% | 100% | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                 | 2%   | 2%   | 12%                                                                               | 2%   | 8%                                                                                  | 6%                                                                                  | 3%                                                                                  | 2%   | 2%   | 3%                                                                                  | 1%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                  | 0    | 0    | 0                                                                                 | 0    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0    | 0    | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     |                                                                                     |      |      |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                    | 0%   |      |                                                                                   | 0%   |                                                                                     |                                                                                     | 0%                                                                                  |      |      | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     |                                                                                     |      |      |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 0                                                                                  | 0    | 0    | 228                                                                               | 0    | 49                                                                                  | 545                                                                                 | 1548                                                                                | 0    | 0    | 911                                                                                 | 253                                                                                 |
| Turn Type               |                                                                                    |      |      | custom                                                                            |      | custom                                                                              | pm+pt                                                                               |                                                                                     |      |      |                                                                                     | Perm                                                                                |
| Protected Phases        |                                                                                    |      |      |                                                                                   |      |                                                                                     | 1                                                                                   | 6                                                                                   |      |      | 2                                                                                   |                                                                                     |
| Permitted Phases        |                                                                                    |      |      | 8                                                                                 |      | 8                                                                                   | 6                                                                                   |                                                                                     |      |      |                                                                                     | 2                                                                                   |
| Detector Phase          |                                                                                    |      |      | 8                                                                                 |      | 8                                                                                   | 1                                                                                   | 6                                                                                   |      |      | 2                                                                                   | 2                                                                                   |
| Switch Phase            |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     |                                                                                     |      |      |                                                                                     |                                                                                     |
| Minimum Initial (s)     |                                                                                    |      |      | 5.0                                                                               |      | 5.0                                                                                 | 5.0                                                                                 | 10.0                                                                                |      |      | 10.0                                                                                | 10.0                                                                                |
| Minimum Split (s)       |                                                                                    |      |      | 20.0                                                                              |      | 20.0                                                                                | 9.0                                                                                 | 20.0                                                                                |      |      | 22.4                                                                                | 22.4                                                                                |
| Total Split (s)         | 0.0                                                                                | 0.0  | 0.0  | 22.0                                                                              | 0.0  | 22.0                                                                                | 37.0                                                                                | 78.0                                                                                | 0.0  | 0.0  | 41.0                                                                                | 41.0                                                                                |
| Total Split (%)         | 0.0%                                                                               | 0.0% | 0.0% | 22.0%                                                                             | 0.0% | 22.0%                                                                               | 37.0%                                                                               | 78.0%                                                                               | 0.0% | 0.0% | 41.0%                                                                               | 41.0%                                                                               |
| Yellow Time (s)         |                                                                                    |      |      | 3.2                                                                               |      | 3.2                                                                                 | 3.0                                                                                 | 3.9                                                                                 |      |      | 3.9                                                                                 | 3.9                                                                                 |
| All-Red Time (s)        |                                                                                    |      |      | 2.0                                                                               |      | 2.0                                                                                 | 1.0                                                                                 | 1.5                                                                                 |      |      | 1.5                                                                                 | 1.5                                                                                 |
| Lost Time Adjust (s)    | 0.0                                                                                | 0.0  | 0.0  | 0.0                                                                               | 0.0  | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0  | 0.0  | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                                | 4.0  | 4.0  | 5.2                                                                               | 4.0  | 5.2                                                                                 | 4.0                                                                                 | 5.4                                                                                 | 4.0  | 4.0  | 5.4                                                                                 | 5.4                                                                                 |
| Lead/Lag                |                                                                                    |      |      |                                                                                   |      |                                                                                     | Lag                                                                                 |                                                                                     |      |      | Lead                                                                                | Lead                                                                                |
| Lead-Lag Optimize?      |                                                                                    |      |      |                                                                                   |      |                                                                                     | Yes                                                                                 |                                                                                     |      |      | Yes                                                                                 | Yes                                                                                 |
| Recall Mode             |                                                                                    |      |      | None                                                                              |      | None                                                                                | None                                                                                | C-Min                                                                               |      |      | C-Min                                                                               | C-Min                                                                               |
| Act Effect Green (s)    |                                                                                    |      |      | 15.2                                                                              |      | 15.2                                                                                | 75.6                                                                                | 74.2                                                                                |      |      | 39.7                                                                                | 39.7                                                                                |
| Actuated g/C Ratio      |                                                                                    |      |      | 0.15                                                                              |      | 0.15                                                                                | 0.76                                                                                | 0.74                                                                                |      |      | 0.40                                                                                | 0.40                                                                                |
| v/c Ratio               |                                                                                    |      |      | 0.82                                                                              |      | 0.18                                                                                | 0.80                                                                                | 0.60                                                                                |      |      | 0.66                                                                                | 0.32                                                                                |
| Control Delay           |                                                                                    |      |      | 64.5                                                                              |      | 12.3                                                                                | 27.6                                                                                | 5.7                                                                                 |      |      | 24.7                                                                                | 6.9                                                                                 |
| Queue Delay             |                                                                                    |      |      | 0.0                                                                               |      | 0.0                                                                                 | 0.0                                                                                 | 1.4                                                                                 |      |      | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             |                                                                                    |      |      | 64.5                                                                              |      | 12.4                                                                                | 27.6                                                                                | 7.1                                                                                 |      |      | 24.7                                                                                | 6.9                                                                                 |
| LOS                     |                                                                                    |      |      | E                                                                                 |      | B                                                                                   | C                                                                                   | A                                                                                   |      |      | C                                                                                   | A                                                                                   |
| Approach Delay          |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     | 12.5                                                                                |      |      | 20.8                                                                                |                                                                                     |
| Approach LOS            |                                                                                    |      |      |                                                                                   |      |                                                                                     |                                                                                     | B                                                                                   |      |      | C                                                                                   |                                                                                     |
| Queue Length 50th (ft)  |                                                                                    |      |      | 140                                                                               |      | 0                                                                                   | 199                                                                                 | 180                                                                                 |      |      | 257                                                                                 | 20                                                                                  |
| Queue Length 95th (ft)  |                                                                                    |      |      | #248                                                                              |      | 32                                                                                  | m318                                                                                | 204                                                                                 |      |      | m283                                                                                | m52                                                                                 |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 190                                                                               |                                                                                   |                                                                                   | 385                                                                               |                                                                                   |                                                                                    | 689                                                                                 |                                                                                     |                                                                                     | 708                                                                                 |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 150                                                                               | 215                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     | 200                                                                                 |
| Base Capacity (vph)     |                                                                                   |                                                                                   |                                                                                   | 307                                                                               |                                                                                   | 292                                                                               | 723                                                                                | 2601                                                                                |                                                                                     |                                                                                     | 1390                                                                                | 787                                                                                 |
| Starvation Cap Reductn  |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     |                                                                                     | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 11                                                                                | 0                                                                                  | 796                                                                                 |                                                                                     |                                                                                     | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     |                                                                                     | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       |                                                                                   |                                                                                   |                                                                                   | 0.74                                                                              |                                                                                   | 0.17                                                                              | 0.75                                                                               | 0.86                                                                                |                                                                                     |                                                                                     | 0.66                                                                                | 0.32                                                                                |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:SBT and 6:NBTL, Start of Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.82

Intersection Signal Delay: 18.6

Intersection LOS: B

Intersection Capacity Utilization 81.6%

ICU Level of Service D

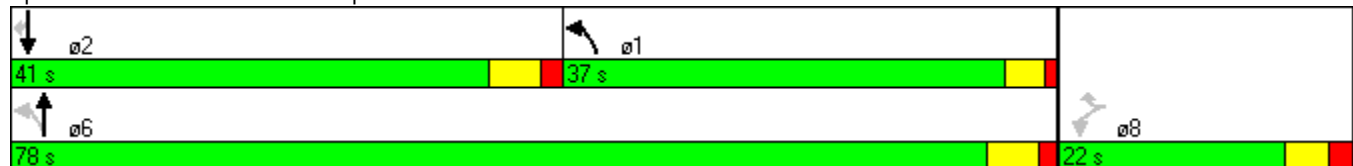
Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: North Ramp & Centennial Rd



|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |                                                                                   |  |  |  |  |                                                                                   |  |  |                                                                                     |  |  |  |
| Volume (vph)            | 28                                                                                | 5                                                                                 | 170                                                                               | 236                                                                               | 2                                                                                 | 149                                                                               | 194                                                                                | 2017                                                                                | 365                                                                                 | 51                                                                                  | 800                                                                                 | 22                                                                                  |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                 | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 0                                                                                 |                                                                                   | 200                                                                               | 200                                                                               |                                                                                   | 200                                                                               | 530                                                                                |                                                                                     | 0                                                                                   | 215                                                                                 |                                                                                     | 150                                                                                 |
| Storage Lanes           | 0                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                  |                                                                                     | 0                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                 |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                    |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                    | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 604                                                                               |                                                                                   |                                                                                   | 932                                                                               |                                                                                   |                                                                                    | 788                                                                                 |                                                                                     |                                                                                     | 1302                                                                                |                                                                                     |
| Travel Time (s)         |                                                                                   | 13.7                                                                              |                                                                                   |                                                                                   | 21.2                                                                              |                                                                                   |                                                                                    | 13.4                                                                                |                                                                                     |                                                                                     | 22.2                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                               | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                               | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                 | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 0                                                                                 | 35                                                                                | 185                                                                               | 257                                                                               | 164                                                                               | 0                                                                                 | 211                                                                                | 2589                                                                                | 0                                                                                   | 55                                                                                  | 894                                                                                 | 0                                                                                   |
| Turn Type               | Perm                                                                              |                                                                                   | Perm                                                                              | Perm                                                                              |                                                                                   |                                                                                   | pm+pt                                                                              |                                                                                     |                                                                                     | pm+pt                                                                               |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 1                                                                                  | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 | 8                                                                                 |                                                                                   |                                                                                   | 6                                                                                  |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 | 4                                                                                 | 4                                                                                 | 8                                                                                 | 8                                                                                 |                                                                                   | 1                                                                                  | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               |                                                                                   | 5.0                                                                                | 4.0                                                                                 |                                                                                     | 5.0                                                                                 | 4.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              |                                                                                   | 9.0                                                                                | 20.0                                                                                |                                                                                     | 9.0                                                                                 | 20.0                                                                                |                                                                                     |
| Total Split (s)         | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 0.0                                                                               | 16.0                                                                               | 68.0                                                                                | 0.0                                                                                 | 12.0                                                                                | 64.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 20.0%                                                                             | 20.0%                                                                             | 20.0%                                                                             | 20.0%                                                                             | 20.0%                                                                             | 0.0%                                                                              | 16.0%                                                                              | 68.0%                                                                               | 0.0%                                                                                | 12.0%                                                                               | 64.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               |                                                                                   | 3.5                                                                                | 3.5                                                                                 |                                                                                     | 3.5                                                                                 | 3.5                                                                                 |                                                                                     |
| All-Red Time (s)        | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               |                                                                                   | 0.5                                                                                | 0.5                                                                                 |                                                                                     | 0.5                                                                                 | 0.5                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                                | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lead                                                                               | Lead                                                                                |                                                                                     | Lag                                                                                 | Lag                                                                                 |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                                | Yes                                                                                 |                                                                                     | Yes                                                                                 | Yes                                                                                 |                                                                                     |
| Recall Mode             | None                                                                              | None                                                                              | None                                                                              | None                                                                              | None                                                                              |                                                                                   | None                                                                               | C-Min                                                                               |                                                                                     | None                                                                                | C-Min                                                                               |                                                                                     |
| Act Effect Green (s)    |                                                                                   | 19.1                                                                              | 19.1                                                                              | 19.1                                                                              | 19.1                                                                              |                                                                                   | 64.0                                                                               | 64.0                                                                                |                                                                                     | 59.8                                                                                | 58.7                                                                                |                                                                                     |
| Actuated g/C Ratio      |                                                                                   | 0.19                                                                              | 0.19                                                                              | 0.19                                                                              | 0.19                                                                              |                                                                                   | 0.64                                                                               | 0.64                                                                                |                                                                                     | 0.60                                                                                | 0.59                                                                                |                                                                                     |
| v/c Ratio               |                                                                                   | 0.13                                                                              | 0.41                                                                              | 0.98                                                                              | 0.40                                                                              |                                                                                   | 0.51                                                                               | 1.16                                                                                |                                                                                     | 0.28                                                                                | 0.43                                                                                |                                                                                     |
| Control Delay           |                                                                                   | 37.4                                                                              | 8.7                                                                               | 94.9                                                                              | 12.9                                                                              |                                                                                   | 9.3                                                                                | 98.6                                                                                |                                                                                     | 13.6                                                                                | 6.5                                                                                 |                                                                                     |
| Queue Delay             |                                                                                   | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                                | 10.9                                                                                |                                                                                     | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |
| Total Delay             |                                                                                   | 37.4                                                                              | 8.7                                                                               | 94.9                                                                              | 12.9                                                                              |                                                                                   | 9.3                                                                                | 109.5                                                                               |                                                                                     | 13.6                                                                                | 6.5                                                                                 |                                                                                     |
| LOS                     |                                                                                   | D                                                                                 | A                                                                                 | F                                                                                 | B                                                                                 |                                                                                   | A                                                                                  | F                                                                                   |                                                                                     | B                                                                                   | A                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 13.3                                                                              |                                                                                   |                                                                                   | 63.0                                                                              |                                                                                   |                                                                                    | 101.9                                                                               |                                                                                     |                                                                                     | 6.9                                                                                 |                                                                                     |
| Approach LOS            |                                                                                   | B                                                                                 |                                                                                   |                                                                                   | E                                                                                 |                                                                                   |                                                                                    | F                                                                                   |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |
| Queue Length 50th (ft)  |                                                                                   | 19                                                                                | 0                                                                                 | ~184                                                                              | 15                                                                                |                                                                                   | 36                                                                                 | ~1055                                                                               |                                                                                     | 7                                                                                   | 58                                                                                  |                                                                                     |
| Queue Length 95th (ft)  |                                                                                   | 48                                                                                | 59                                                                                | #353                                                                              | 74                                                                                |                                                                                   | 57                                                                                 | #1196                                                                               |                                                                                     | m13                                                                                 | 59                                                                                  |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 524                                                                               |                                                                                   |                                                                                   | 852                                                                               |                                                                                   |                                                                                    | 708                                                                                 |                                                                                     |                                                                                     | 1222                                                                                |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   | 200                                                                               | 200                                                                               |                                                                                   |                                                                                   | 530                                                                                |                                                                                     |                                                                                     | 215                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     |                                                                                   | 263                                                                               | 453                                                                               | 262                                                                               | 414                                                                               |                                                                                   | 436                                                                                | 2228                                                                                |                                                                                     | 216                                                                                 | 2126                                                                                |                                                                                     |
| Starvation Cap Reductn  |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 46                                                                                  |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       |                                                                                   | 0.13                                                                              | 0.41                                                                              | 0.98                                                                              | 0.40                                                                              |                                                                                   | 0.48                                                                               | 1.19                                                                                |                                                                                     | 0.25                                                                                | 0.42                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 40 (40%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 150

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.16

Intersection Signal Delay: 73.2

Intersection LOS: E

Intersection Capacity Utilization 101.3%

ICU Level of Service G

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Trenton Dr & Centennial Rd

|                                                                                        |                                                                                          |                                                                                          |
|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
|  ø1 |  ø2   |  ø4 |
| 16 s                                                                                   | 64 s                                                                                     | 20 s                                                                                     |
|  ø6 |  ø5 |  ø8 |
| 68 s                                                                                   | 12 s                                                                                     | 20 s                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |  |  |  |  |  |  |                                                                                     |  |  |  |
| Volume (vph)            | 149                                                                               | 459                                                                               | 387                                                                               | 235                                                                               | 189                                                                               | 46                                                                                | 252                                                                                 | 798                                                                                 | 343                                                                                 | 78                                                                                  | 534                                                                                 | 66                                                                                  |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                                 |                                                                                     | 0                                                                                   | 215                                                                                 |                                                                                     | 215                                                                                 |
| Storage Lanes           | 1                                                                                 |                                                                                   | 1                                                                                 | 2                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                   |                                                                                     | 0                                                                                   | 1                                                                                   |                                                                                     | 1                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                  |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 35                                                                                |                                                                                   |                                                                                   | 35                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 637                                                                               |                                                                                   |                                                                                   | 607                                                                               |                                                                                   |                                                                                     | 1302                                                                                |                                                                                     |                                                                                     | 516                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 12.4                                                                              |                                                                                   |                                                                                   | 11.8                                                                              |                                                                                   |                                                                                     | 22.2                                                                                |                                                                                     |                                                                                     | 8.8                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 162                                                                               | 499                                                                               | 421                                                                               | 255                                                                               | 205                                                                               | 50                                                                                | 274                                                                                 | 1240                                                                                | 0                                                                                   | 85                                                                                  | 580                                                                                 | 72                                                                                  |
| Turn Type               | pm+pt                                                                             |                                                                                   | Perm                                                                              | pm+pt                                                                             |                                                                                   | Perm                                                                              | pm+pt                                                                               |                                                                                     |                                                                                     | pm+pt                                                                               |                                                                                     | Perm                                                                                |
| Protected Phases        | 7                                                                                 | 4                                                                                 |                                                                                   | 3                                                                                 | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     | 2                                                                                   |
| Detector Phase          | 7                                                                                 | 4                                                                                 | 4                                                                                 | 3                                                                                 | 8                                                                                 | 8                                                                                 | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   | 2                                                                                   |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 4.0                                                                               | 10.0                                                                              | 10.0                                                                              | 4.0                                                                               | 10.0                                                                              | 10.0                                                                              | 4.0                                                                                 | 6.0                                                                                 |                                                                                     | 4.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 |
| Minimum Split (s)       | 8.0                                                                               | 15.7                                                                              | 15.7                                                                              | 8.0                                                                               | 15.7                                                                              | 15.7                                                                              | 8.0                                                                                 | 11.5                                                                                |                                                                                     | 8.0                                                                                 | 11.5                                                                                | 11.5                                                                                |
| Total Split (s)         | 13.0                                                                              | 24.0                                                                              | 24.0                                                                              | 13.0                                                                              | 24.0                                                                              | 24.0                                                                              | 19.0                                                                                | 51.0                                                                                | 0.0                                                                                 | 12.0                                                                                | 44.0                                                                                | 44.0                                                                                |
| Total Split (%)         | 13.0%                                                                             | 24.0%                                                                             | 24.0%                                                                             | 13.0%                                                                             | 24.0%                                                                             | 24.0%                                                                             | 19.0%                                                                               | 51.0%                                                                               | 0.0%                                                                                | 12.0%                                                                               | 44.0%                                                                               | 44.0%                                                                               |
| Yellow Time (s)         | 3.5                                                                               | 3.9                                                                               | 3.9                                                                               | 3.5                                                                               | 3.9                                                                               | 3.9                                                                               | 3.5                                                                                 | 3.6                                                                                 |                                                                                     | 3.5                                                                                 | 3.6                                                                                 | 3.6                                                                                 |
| All-Red Time (s)        | 0.5                                                                               | 1.8                                                                               | 1.8                                                                               | 0.5                                                                               | 1.8                                                                               | 1.8                                                                               | 0.5                                                                                 | 1.9                                                                                 |                                                                                     | 0.5                                                                                 | 1.9                                                                                 | 1.9                                                                                 |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 5.7                                                                               | 5.7                                                                               | 4.0                                                                               | 5.7                                                                               | 5.7                                                                               | 4.0                                                                                 | 5.5                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 5.5                                                                                 | 5.5                                                                                 |
| Lead/Lag                | Lead                                                                              | Lag                                                                               | Lag                                                                               | Lead                                                                              | Lag                                                                               | Lag                                                                               | Lag                                                                                 | Lag                                                                                 |                                                                                     | Lead                                                                                | Lead                                                                                | Lead                                                                                |
| Lead-Lag Optimize?      | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                                 | Yes                                                                                 |                                                                                     | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 |
| Recall Mode             | None                                                                              | Max                                                                               | Max                                                                               | None                                                                              | Max                                                                               | Max                                                                               | None                                                                                | C-Max                                                                               |                                                                                     | None                                                                                | C-Max                                                                               | C-Max                                                                               |
| Act Effect Green (s)    | 28.8                                                                              | 18.3                                                                              | 18.3                                                                              | 28.9                                                                              | 18.3                                                                              | 18.3                                                                              | 49.7                                                                                | 48.2                                                                                |                                                                                     | 40.2                                                                                | 38.7                                                                                | 38.7                                                                                |
| Actuated g/C Ratio      | 0.29                                                                              | 0.18                                                                              | 0.18                                                                              | 0.29                                                                              | 0.18                                                                              | 0.18                                                                              | 0.50                                                                                | 0.48                                                                                |                                                                                     | 0.40                                                                                | 0.39                                                                                | 0.39                                                                                |
| v/c Ratio               | 0.42                                                                              | 0.77                                                                              | 0.71                                                                              | 0.52                                                                              | 0.32                                                                              | 0.15                                                                              | 0.50                                                                                | 0.74                                                                                |                                                                                     | 0.41                                                                                | 0.42                                                                                | 0.11                                                                                |
| Control Delay           | 28.9                                                                              | 47.9                                                                              | 14.4                                                                              | 28.5                                                                              | 37.0                                                                              | 11.2                                                                              | 9.4                                                                                 | 6.9                                                                                 |                                                                                     | 25.0                                                                                | 23.7                                                                                | 5.3                                                                                 |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 |                                                                                     | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             | 28.9                                                                              | 47.9                                                                              | 14.4                                                                              | 28.5                                                                              | 37.0                                                                              | 11.2                                                                              | 9.4                                                                                 | 6.9                                                                                 |                                                                                     | 25.0                                                                                | 23.7                                                                                | 5.3                                                                                 |
| LOS                     | C                                                                                 | D                                                                                 | B                                                                                 | C                                                                                 | D                                                                                 | B                                                                                 | A                                                                                   | A                                                                                   |                                                                                     | C                                                                                   | C                                                                                   | A                                                                                   |
| Approach Delay          |                                                                                   | 32.0                                                                              |                                                                                   |                                                                                   | 30.2                                                                              |                                                                                   |                                                                                     | 7.4                                                                                 |                                                                                     |                                                                                     | 22.1                                                                                |                                                                                     |
| Approach LOS            |                                                                                   | C                                                                                 |                                                                                   |                                                                                   | C                                                                                 |                                                                                   |                                                                                     | A                                                                                   |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 76                                                                                | 161                                                                               | 30                                                                                | 60                                                                                | 60                                                                                | 0                                                                                 | 59                                                                                  | 200                                                                                 |                                                                                     | 34                                                                                  | 140                                                                                 | 0                                                                                   |
| Queue Length 95th (ft)  | 129                                                                               | 218                                                                               | 136                                                                               | 91                                                                                | 94                                                                                | 32                                                                                | m55                                                                                 | m162                                                                                |                                                                                     | 65                                                                                  | 188                                                                                 | 27                                                                                  |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 557                                                                               |                                                                                   |                                                                                   | 527                                                                               |                                                                                   |                                                                                     | 1222                                                                                |                                                                                     |                                                                                     | 436                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                                 |                                                                                     |                                                                                     | 215                                                                                 |                                                                                     | 215                                                                                 |
| Base Capacity (vph)     | 391                                                                               | 648                                                                               | 589                                                                               | 495                                                                               | 649                                                                               | 332                                                                               | 546                                                                                 | 1674                                                                                |                                                                                     | 217                                                                                 | 1369                                                                                | 656                                                                                 |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       | 0.41                                                                              | 0.77                                                                              | 0.71                                                                              | 0.52                                                                              | 0.32                                                                              | 0.15                                                                              | 0.50                                                                                | 0.74                                                                                |                                                                                     | 0.39                                                                                | 0.42                                                                                | 0.11                                                                                |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 65 (65%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 65

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.77

Intersection Signal Delay: 20.2

Intersection LOS: C

Intersection Capacity Utilization 72.7%

ICU Level of Service C

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: Century Ave & Centennial Rd

|                                                                                        |                                                                                        |                                                                                         |                                                                                          |
|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
|  ø2  |  ø1  |  ø3  |  ø4  |
| 44 s                                                                                   | 19 s                                                                                   | 13 s                                                                                    | 24 s                                                                                     |
|  ø5 |  ø6 |  ø7 |  ø8 |
| 12 s                                                                                   | 51 s                                                                                   | 13 s                                                                                    | 24 s                                                                                     |



**Appendix BB: 2059 - Signal at Trenton & NE Loop Ramp AM (4C1)**

Exit 161 Operational Study  
Bismarck, ND

1: Divide Ave & Bismarck Expy

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |                                                                                   |  |  |  |  |  |  |  |  |  |
| Volume (vph)            | 161                                                                               | 173                                                                               | 25                                                                                | 267                                                                               | 182                                                                               | 623                                                                               | 34                                                                                  | 578                                                                                 | 97                                                                                  | 462                                                                                 | 1584                                                                                | 353                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 150                                                                               |                                                                                   | 0                                                                                 | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                 |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                   |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 100                                                                               |                                                                                   | 25                                                                                | 100                                                                               |                                                                                   | 100                                                                               | 100                                                                                 |                                                                                     | 150                                                                                 | 100                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 25                                                                                |                                                                                   |                                                                                   | 25                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 371                                                                               |                                                                                   |                                                                                   | 341                                                                               |                                                                                   |                                                                                     | 614                                                                                 |                                                                                     |                                                                                     | 458                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 10.1                                                                              |                                                                                   |                                                                                   | 9.3                                                                               |                                                                                   |                                                                                     | 10.5                                                                                |                                                                                     |                                                                                     | 7.8                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 4%                                                                                | 1%                                                                                | 1%                                                                                | 11%                                                                               | 10%                                                                               | 22%                                                                               | 10%                                                                                 | 7%                                                                                  | 17%                                                                                 | 11%                                                                                 | 4%                                                                                  | 4%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 175                                                                               | 215                                                                               | 0                                                                                 | 290                                                                               | 198                                                                               | 677                                                                               | 37                                                                                  | 628                                                                                 | 105                                                                                 | 502                                                                                 | 2106                                                                                | 0                                                                                   |
| Turn Type               | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                              |                                                                                   | pm+ov                                                                             | Perm                                                                                |                                                                                     | Perm                                                                                | pm+pt                                                                               |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 | 5                                                                                 |                                                                                     | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                   |                                                                                     | 6                                                                                   | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 | 4                                                                                 |                                                                                   | 8                                                                                 | 8                                                                                 | 5                                                                                 | 6                                                                                   | 6                                                                                   | 6                                                                                   | 5                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               | 6.0                                                                               |                                                                                   | 6.0                                                                               | 6.0                                                                               | 5.0                                                                               | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 5.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 30.0                                                                              | 30.0                                                                              |                                                                                   | 30.0                                                                              | 30.0                                                                              | 9.8                                                                               | 22.9                                                                                | 22.9                                                                                | 22.9                                                                                | 9.8                                                                                 | 28.7                                                                                |                                                                                     |
| Total Split (s)         | 34.0                                                                              | 34.0                                                                              | 0.0                                                                               | 34.0                                                                              | 34.0                                                                              | 35.4                                                                              | 30.6                                                                                | 30.6                                                                                | 30.6                                                                                | 35.4                                                                                | 66.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 34.0%                                                                             | 34.0%                                                                             | 0.0%                                                                              | 34.0%                                                                             | 34.0%                                                                             | 35.4%                                                                             | 30.6%                                                                               | 30.6%                                                                               | 30.6%                                                                               | 35.4%                                                                               | 66.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 3.0                                                                               | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 | 3.0                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 1.0                                                                               | 1.8                                                                                 | 1.8                                                                                 | 1.8                                                                                 | 1.0                                                                                 | 1.8                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 5.7                                                                                 | 5.7                                                                                 | 5.7                                                                                 | 4.0                                                                                 | 5.7                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lead                                                                              | Lag                                                                                 | Lag                                                                                 | Lag                                                                                 | Lag                                                                                 | Lead                                                                                |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                               | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 |                                                                                     |
| Recall Mode             | None                                                                              | None                                                                              |                                                                                   | None                                                                              | None                                                                              | None                                                                              | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               | None                                                                                | C-Min                                                                               |                                                                                     |
| Act Effect Green (s)    | 28.0                                                                              | 28.0                                                                              |                                                                                   | 28.0                                                                              | 28.0                                                                              | 61.3                                                                              | 29.0                                                                                | 29.0                                                                                | 29.0                                                                                | 62.0                                                                                | 60.3                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.28                                                                              | 0.28                                                                              |                                                                                   | 0.28                                                                              | 0.28                                                                              | 0.61                                                                              | 0.29                                                                                | 0.29                                                                                | 0.29                                                                                | 0.62                                                                                | 0.60                                                                                |                                                                                     |
| v/c Ratio               | 0.60                                                                              | 0.41                                                                              |                                                                                   | 1.12                                                                              | 0.41                                                                              | 0.82                                                                              | 0.54                                                                                | 0.64                                                                                | 0.22                                                                                | 0.86                                                                                | 1.02                                                                                |                                                                                     |
| Control Delay           | 41.3                                                                              | 31.2                                                                              |                                                                                   | 127.6                                                                             | 32.4                                                                              | 23.2                                                                              | 65.0                                                                                | 35.8                                                                                | 7.4                                                                                 | 28.5                                                                                | 37.9                                                                                |                                                                                     |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 36.7                                                                                |                                                                                     |
| Total Delay             | 41.3                                                                              | 31.2                                                                              |                                                                                   | 127.6                                                                             | 32.4                                                                              | 23.2                                                                              | 65.0                                                                                | 35.8                                                                                | 7.4                                                                                 | 28.5                                                                                | 74.5                                                                                |                                                                                     |
| LOS                     | D                                                                                 | C                                                                                 |                                                                                   | F                                                                                 | C                                                                                 | C                                                                                 | E                                                                                   | D                                                                                   | A                                                                                   | C                                                                                   | E                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 35.7                                                                              |                                                                                   |                                                                                   | 50.7                                                                              |                                                                                   |                                                                                     | 33.3                                                                                |                                                                                     |                                                                                     | 65.7                                                                                |                                                                                     |
| Approach LOS            |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | D                                                                                 |                                                                                   |                                                                                     | C                                                                                   |                                                                                     |                                                                                     | E                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 97                                                                                | 108                                                                               |                                                                                   | ~214                                                                              | 103                                                                               | 263                                                                               | 21                                                                                  | 193                                                                                 | 0                                                                                   | 205                                                                                 | ~606                                                                                |                                                                                     |
| Queue Length 95th (ft)  | 172                                                                               | 176                                                                               |                                                                                   | #377                                                                              | 168                                                                               | 435                                                                               | #77                                                                                 | 259                                                                                 | 41                                                                                  | m258                                                                                | #885                                                                                |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 291                                                                               |                                                                                   |                                                                                   | 261                                                                               |                                                                                   |                                                                                    | 534                                                                                 |                                                                                     |                                                                                     | 378                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 150                                                                               |                                                                                   |                                                                                   | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 291                                                                               | 522                                                                               |                                                                                   | 259                                                                               | 484                                                                               | 878                                                                               | 69                                                                                 | 978                                                                                 | 474                                                                                 | 634                                                                                 | 2055                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 167                                                                                 |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.60                                                                              | 0.41                                                                              |                                                                                   | 1.12                                                                              | 0.41                                                                              | 0.77                                                                              | 0.54                                                                               | 0.64                                                                                | 0.22                                                                                | 0.79                                                                                | 1.12                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 48 (48%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 110

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.12

Intersection Signal Delay: 54.7

Intersection LOS: D

Intersection Capacity Utilization 105.0%

ICU Level of Service G

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Divide Ave & Bismarck Expy



|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |                                                                                   |  |                                                                                   |                                                                                   |                                                                                   |                                                                                    |  |  |  |  |  |
| Volume (vph)            | 188                                                                               | 0                                                                                 | 764                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 926                                                                                 | 135                                                                                 | 39                                                                                  | 1528                                                                                | 0                                                                                   |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                 | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 200                                                                               |                                                                                   | 200                                                                               | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  |                                                                                     | 0                                                                                   | 222                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 2                                                                                 |                                                                                   | 2                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 300                                                                               | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                 |                                                                                     | 25                                                                                  | 150                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                    |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                    | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 575                                                                               |                                                                                   |                                                                                   | 383                                                                               |                                                                                   |                                                                                    | 458                                                                                 |                                                                                     |                                                                                     | 769                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 13.1                                                                              |                                                                                   |                                                                                   | 8.7                                                                               |                                                                                   |                                                                                    | 7.8                                                                                 |                                                                                     |                                                                                     | 13.1                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                               | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                               | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 3%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                 | 8%                                                                                  | 27%                                                                                 | 10%                                                                                 | 9%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 204                                                                               | 0                                                                                 | 830                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 1007                                                                                | 147                                                                                 | 42                                                                                  | 1661                                                                                | 0                                                                                   |
| Turn Type               | custom                                                                            |                                                                                   | custom                                                                            |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     | Perm                                                                                | Perm                                                                                |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     | 6                                                                                   | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                   | 6                                                                                   | 2                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               |                                                                                   | 6.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 21.1                                                                              |                                                                                   | 21.1                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 23.4                                                                                | 23.4                                                                                | 21.4                                                                                | 21.4                                                                                |                                                                                     |
| Total Split (s)         | 37.9                                                                              | 0.0                                                                               | 37.9                                                                              | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 62.1                                                                                | 62.1                                                                                | 62.1                                                                                | 62.1                                                                                | 0.0                                                                                 |
| Total Split (%)         | 37.9%                                                                             | 0.0%                                                                              | 37.9%                                                                             | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                               | 62.1%                                                                               | 62.1%                                                                               | 62.1%                                                                               | 62.1%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.6                                                                               |                                                                                   | 3.6                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 1.5                                                                               |                                                                                   | 1.5                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 1.5                                                                                 | 1.5                                                                                 | 1.5                                                                                 | 1.5                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 5.1                                                                               | 4.0                                                                               | 5.1                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                                | 5.4                                                                                 | 5.4                                                                                 | 5.4                                                                                 | 5.4                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Recall Mode             | None                                                                              |                                                                                   | None                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               |                                                                                     |
| Act Effct Green (s)     | 31.6                                                                              |                                                                                   | 31.6                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 57.9                                                                                | 57.9                                                                                | 57.9                                                                                | 57.9                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.32                                                                              |                                                                                   | 0.32                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.58                                                                                | 0.58                                                                                | 0.58                                                                                | 0.58                                                                                |                                                                                     |
| v/c Ratio               | 0.19                                                                              |                                                                                   | 0.92                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.52                                                                                | 0.18                                                                                | 0.19                                                                                | 0.87                                                                                |                                                                                     |
| Control Delay           | 25.1                                                                              |                                                                                   | 47.6                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 13.3                                                                                | 3.1                                                                                 | 6.6                                                                                 | 14.8                                                                                |                                                                                     |
| Queue Delay             | 0.0                                                                               |                                                                                   | 4.5                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.2                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 20.2                                                                                |                                                                                     |
| Total Delay             | 25.1                                                                              |                                                                                   | 52.1                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 13.5                                                                                | 3.1                                                                                 | 6.6                                                                                 | 35.0                                                                                |                                                                                     |
| LOS                     | C                                                                                 |                                                                                   | D                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | B                                                                                   | A                                                                                   | A                                                                                   | C                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 12.1                                                                                |                                                                                     |                                                                                     | 34.3                                                                                |                                                                                     |
| Approach LOS            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | B                                                                                   |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 47                                                                                |                                                                                   | 272                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 177                                                                                 | 9                                                                                   | 9                                                                                   | 373                                                                                 |                                                                                     |
| Queue Length 95th (ft)  | 75                                                                                |                                                                                   | #396                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 194                                                                                 | m15                                                                                 | m9                                                                                  | 503                                                                                 |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 495                                                                               |                                                                                   |                                                                                   | 303                                                                               |                                                                                   |                                                                                    | 378                                                                                 |                                                                                     |                                                                                     | 689                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 200                                                                               |                                                                                   | 200                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | 222                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 1115                                                                              |                                                                                   | 938                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 1937                                                                                | 799                                                                                 | 226                                                                                 | 1919                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 259                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 |                                                                                   | 65                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 311                                                                                 |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.18                                                                              |                                                                                   | 0.95                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.60                                                                                | 0.18                                                                                | 0.19                                                                                | 1.03                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 24 (24%), Referenced to phase 2:SBTL and 6:NBT, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.92

Intersection Signal Delay: 31.0

Intersection LOS: C

Intersection Capacity Utilization 77.7%

ICU Level of Service D

Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: South Ramp & Centennial Rd

|                                                                                     |                                                                                      |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
|  |  |
| ø2                                                                                  | ø4                                                                                   |
| 62.1 s                                                                              | 37.9 s                                                                               |
|  |                                                                                      |
| ø6                                                                                  |                                                                                      |
| 62.1 s                                                                              |                                                                                      |

|                         |  |      |      |                                                                                   |      |                                                                                   |      |                                                                                     |                                                                                     |      |                                                                                     |                                                                                     |
|-------------------------|------------------------------------------------------------------------------------|------|------|-----------------------------------------------------------------------------------|------|-----------------------------------------------------------------------------------|------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                                | EBT  | EBR  | WBL                                                                               | WBT  | WBR                                                                               | NBL  | NBT                                                                                 | NBR                                                                                 | SBL  | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |                                                                                    |      |      |  |      |  |      |  |  |      |  |  |
| Volume (vph)            | 0                                                                                  | 0    | 0    | 193                                                                               | 0    | 19                                                                                | 0    | 573                                                                                 | 447                                                                                 | 0    | 2128                                                                                | 475                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                               | 1900 | 1900 | 1900                                                                              | 1900 | 1900                                                                              | 1900 | 1900                                                                                | 1900                                                                                | 1900 | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                 | 12   | 12   | 16                                                                                | 12   | 12                                                                                | 12   | 12                                                                                  | 12                                                                                  | 12   | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                    | 0%   |      |                                                                                   | 0%   |                                                                                   |      | 0%                                                                                  |                                                                                     |      | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 0                                                                                  |      | 0    | 0                                                                                 |      | 150                                                                               | 0    |                                                                                     | 215                                                                                 | 0    |                                                                                     | 200                                                                                 |
| Storage Lanes           | 0                                                                                  |      | 0    | 1                                                                                 |      | 1                                                                                 | 0    |                                                                                     | 1                                                                                   | 0    |                                                                                     | 1                                                                                   |
| Taper Length (ft)       | 25                                                                                 |      | 25   | 25                                                                                |      | 100                                                                               | 150  |                                                                                     | 25                                                                                  | 25   |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                    |      | Yes  |                                                                                   |      | Yes                                                                               |      |                                                                                     | Yes                                                                                 |      |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                    | 30   |      |                                                                                   | 30   |                                                                                   |      | 40                                                                                  |                                                                                     |      | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                    | 270  |      |                                                                                   | 465  |                                                                                   |      | 769                                                                                 |                                                                                     |      | 782                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                    | 6.1  |      |                                                                                   | 10.6 |                                                                                   |      | 13.1                                                                                |                                                                                     |      | 13.3                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                    |      |      |                                                                                   |      |                                                                                   |      |                                                                                     |                                                                                     |      |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                    |      |      |                                                                                   |      |                                                                                   |      |                                                                                     |                                                                                     |      |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                               | 0.92 | 0.92 | 0.92                                                                              | 0.92 | 0.92                                                                              | 0.92 | 0.92                                                                                | 0.92                                                                                | 0.92 | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                               | 100% | 100% | 100%                                                                              | 100% | 100%                                                                              | 100% | 100%                                                                                | 100%                                                                                | 100% | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                 | 2%   | 2%   | 12%                                                                               | 2%   | 8%                                                                                | 6%   | 3%                                                                                  | 2%                                                                                  | 2%   | 3%                                                                                  | 1%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                  | 0    | 0    | 0                                                                                 | 0    | 0                                                                                 | 0    | 0                                                                                   | 0                                                                                   | 0    | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                    |      |      |                                                                                   |      |                                                                                   |      |                                                                                     |                                                                                     |      |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                    | 0%   |      |                                                                                   | 0%   |                                                                                   |      | 0%                                                                                  |                                                                                     |      | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                    |      |      |                                                                                   |      |                                                                                   |      |                                                                                     |                                                                                     |      |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 0                                                                                  | 0    | 0    | 210                                                                               | 0    | 21                                                                                | 0    | 623                                                                                 | 486                                                                                 | 0    | 2313                                                                                | 516                                                                                 |
| Turn Type               |                                                                                    |      |      | custom                                                                            |      | custom                                                                            |      |                                                                                     | Free                                                                                |      |                                                                                     | Perm                                                                                |
| Protected Phases        |                                                                                    |      |      |                                                                                   |      |                                                                                   |      | 6                                                                                   |                                                                                     |      | 2                                                                                   |                                                                                     |
| Permitted Phases        |                                                                                    |      |      | 8                                                                                 |      | 8                                                                                 |      |                                                                                     | Free                                                                                |      |                                                                                     | 2                                                                                   |
| Detector Phase          |                                                                                    |      |      | 8                                                                                 |      | 8                                                                                 |      | 6                                                                                   |                                                                                     |      | 2                                                                                   | 2                                                                                   |
| Switch Phase            |                                                                                    |      |      |                                                                                   |      |                                                                                   |      |                                                                                     |                                                                                     |      |                                                                                     |                                                                                     |
| Minimum Initial (s)     |                                                                                    |      |      | 5.0                                                                               |      | 5.0                                                                               |      | 10.0                                                                                |                                                                                     |      | 10.0                                                                                | 10.0                                                                                |
| Minimum Split (s)       |                                                                                    |      |      | 20.0                                                                              |      | 20.0                                                                              |      | 20.0                                                                                |                                                                                     |      | 22.4                                                                                | 22.4                                                                                |
| Total Split (s)         | 0.0                                                                                | 0.0  | 0.0  | 20.0                                                                              | 0.0  | 20.0                                                                              | 0.0  | 80.0                                                                                | 0.0                                                                                 | 0.0  | 80.0                                                                                | 80.0                                                                                |
| Total Split (%)         | 0.0%                                                                               | 0.0% | 0.0% | 20.0%                                                                             | 0.0% | 20.0%                                                                             | 0.0% | 80.0%                                                                               | 0.0%                                                                                | 0.0% | 80.0%                                                                               | 80.0%                                                                               |
| Yellow Time (s)         |                                                                                    |      |      | 3.2                                                                               |      | 3.2                                                                               |      | 3.9                                                                                 |                                                                                     |      | 3.9                                                                                 | 3.9                                                                                 |
| All-Red Time (s)        |                                                                                    |      |      | 2.0                                                                               |      | 2.0                                                                               |      | 1.5                                                                                 |                                                                                     |      | 1.5                                                                                 | 1.5                                                                                 |
| Lost Time Adjust (s)    | 0.0                                                                                | 0.0  | 0.0  | 0.0                                                                               | 0.0  | 0.0                                                                               | 0.0  | 0.0                                                                                 | 0.0                                                                                 | 0.0  | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                                | 4.0  | 4.0  | 5.2                                                                               | 4.0  | 5.2                                                                               | 4.0  | 5.4                                                                                 | 4.0                                                                                 | 4.0  | 5.4                                                                                 | 5.4                                                                                 |
| Lead/Lag                |                                                                                    |      |      |                                                                                   |      |                                                                                   |      |                                                                                     |                                                                                     |      |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                    |      |      |                                                                                   |      |                                                                                   |      |                                                                                     |                                                                                     |      |                                                                                     |                                                                                     |
| Recall Mode             |                                                                                    |      |      | None                                                                              |      | None                                                                              |      | C-Min                                                                               |                                                                                     |      | C-Min                                                                               | C-Min                                                                               |
| Act Effect Green (s)    |                                                                                    |      |      | 13.8                                                                              |      | 13.8                                                                              |      | 75.6                                                                                | 100.0                                                                               |      | 75.6                                                                                | 75.6                                                                                |
| Actuated g/C Ratio      |                                                                                    |      |      | 0.14                                                                              |      | 0.14                                                                              |      | 0.76                                                                                | 1.00                                                                                |      | 0.76                                                                                | 0.76                                                                                |
| v/c Ratio               |                                                                                    |      |      | 0.83                                                                              |      | 0.09                                                                              |      | 0.24                                                                                | 0.31                                                                                |      | 0.87                                                                                | 0.39                                                                                |
| Control Delay           |                                                                                    |      |      | 69.3                                                                              |      | 16.1                                                                              |      | 5.4                                                                                 | 0.5                                                                                 |      | 5.2                                                                                 | 0.6                                                                                 |
| Queue Delay             |                                                                                    |      |      | 0.0                                                                               |      | 0.0                                                                               |      | 0.0                                                                                 | 0.0                                                                                 |      | 0.5                                                                                 | 0.0                                                                                 |
| Total Delay             |                                                                                    |      |      | 69.3                                                                              |      | 16.1                                                                              |      | 5.4                                                                                 | 0.5                                                                                 |      | 5.7                                                                                 | 0.6                                                                                 |
| LOS                     |                                                                                    |      |      | E                                                                                 |      | B                                                                                 |      | A                                                                                   | A                                                                                   |      | A                                                                                   | A                                                                                   |
| Approach Delay          |                                                                                    |      |      |                                                                                   |      |                                                                                   |      | 3.2                                                                                 |                                                                                     |      | 4.8                                                                                 |                                                                                     |
| Approach LOS            |                                                                                    |      |      |                                                                                   |      |                                                                                   |      | A                                                                                   |                                                                                     |      | A                                                                                   |                                                                                     |
| Queue Length 50th (ft)  |                                                                                    |      |      | 130                                                                               |      | 0                                                                                 |      | 81                                                                                  | 0                                                                                   |      | 177                                                                                 | 3                                                                                   |
| Queue Length 95th (ft)  |                                                                                    |      |      | #244                                                                              |      | 22                                                                                |      | 102                                                                                 | 0                                                                                   |      | m161                                                                                | m0                                                                                  |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 190                                                                               |                                                                                   |                                                                                   | 385                                                                               |                                                                                   |                                                                                    | 689                                                                                 |                                                                                     |                                                                                     | 702                                                                                 |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 150                                                                               |                                                                                    |                                                                                     | 215                                                                                 |                                                                                     |                                                                                     | 200                                                                                 |
| Base Capacity (vph)     |                                                                                   |                                                                                   |                                                                                   | 270                                                                               |                                                                                   | 239                                                                               |                                                                                    | 2651                                                                                | 1583                                                                                |                                                                                     | 2651                                                                                | 1335                                                                                |
| Starvation Cap Reductn  |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                    | 0                                                                                   | 0                                                                                   |                                                                                     | 93                                                                                  | 0                                                                                   |
| Spillback Cap Reductn   |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                    | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                    | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       |                                                                                   |                                                                                   |                                                                                   | 0.78                                                                              |                                                                                   | 0.09                                                                              |                                                                                    | 0.24                                                                                | 0.31                                                                                |                                                                                     | 0.90                                                                                | 0.39                                                                                |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 93 (93%), Referenced to phase 2:SBT and 6:NBT, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.87

Intersection Signal Delay: 7.7

Intersection LOS: A

Intersection Capacity Utilization 77.3%

ICU Level of Service D

Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: North Ramp & Centennial Rd



|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |                                                                                   |  |  |  |  |                                                                                   |  |  |                                                                                     |  |  |                                                                                     |
| Volume (vph)            | 14                                                                                | 2                                                                                 | 423                                                                               | 177                                                                               | 9                                                                                 | 79                                                                                | 107                                                                                 | 595                                                                                 | 140                                                                                 | 22                                                                                  | 1755                                                                                | 29                                                                                  |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 0                                                                                 |                                                                                   | 200                                                                               | 200                                                                               |                                                                                   | 200                                                                               | 530                                                                                 |                                                                                     | 0                                                                                   | 215                                                                                 |                                                                                     | 150                                                                                 |
| Storage Lanes           | 0                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                   |                                                                                     | 0                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                  |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 632                                                                               |                                                                                   |                                                                                   | 937                                                                               |                                                                                   |                                                                                     | 782                                                                                 |                                                                                     |                                                                                     | 1308                                                                                |                                                                                     |
| Travel Time (s)         |                                                                                   | 14.4                                                                              |                                                                                   |                                                                                   | 21.3                                                                              |                                                                                   |                                                                                     | 13.3                                                                                |                                                                                     |                                                                                     | 22.3                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 0                                                                                 | 17                                                                                | 460                                                                               | 192                                                                               | 96                                                                                | 0                                                                                 | 116                                                                                 | 799                                                                                 | 0                                                                                   | 24                                                                                  | 1940                                                                                | 0                                                                                   |
| Turn Type               | Perm                                                                              |                                                                                   | Perm                                                                              | Perm                                                                              |                                                                                   |                                                                                   | pm+pt                                                                               |                                                                                     |                                                                                     | Perm                                                                                |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 | 8                                                                                 |                                                                                   |                                                                                   | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 | 4                                                                                 | 4                                                                                 | 8                                                                                 | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     | 2                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               |                                                                                   | 5.0                                                                                 | 4.0                                                                                 |                                                                                     | 4.0                                                                                 | 4.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              |                                                                                   | 9.0                                                                                 | 20.0                                                                                |                                                                                     | 20.0                                                                                | 20.0                                                                                |                                                                                     |
| Total Split (s)         | 29.0                                                                              | 29.0                                                                              | 29.0                                                                              | 29.0                                                                              | 29.0                                                                              | 0.0                                                                               | 12.0                                                                                | 71.0                                                                                | 0.0                                                                                 | 59.0                                                                                | 59.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 29.0%                                                                             | 29.0%                                                                             | 29.0%                                                                             | 29.0%                                                                             | 29.0%                                                                             | 0.0%                                                                              | 12.0%                                                                               | 71.0%                                                                               | 0.0%                                                                                | 59.0%                                                                               | 59.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               |                                                                                   | 3.5                                                                                 | 3.5                                                                                 |                                                                                     | 3.5                                                                                 | 3.5                                                                                 |                                                                                     |
| All-Red Time (s)        | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               |                                                                                   | 0.5                                                                                 | 0.5                                                                                 |                                                                                     | 0.5                                                                                 | 0.5                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lag                                                                                 |                                                                                     |                                                                                     | Lead                                                                                | Lead                                                                                |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 | Yes                                                                                 |                                                                                     |
| Recall Mode             | None                                                                              | None                                                                              | None                                                                              | None                                                                              | None                                                                              |                                                                                   | None                                                                                | C-Min                                                                               |                                                                                     | C-Min                                                                               | C-Min                                                                               |                                                                                     |
| Act Effct Green (s)     |                                                                                   | 23.9                                                                              | 23.9                                                                              | 23.9                                                                              | 23.9                                                                              |                                                                                   | 68.1                                                                                | 68.1                                                                                |                                                                                     | 57.2                                                                                | 57.2                                                                                |                                                                                     |
| Actuated g/C Ratio      |                                                                                   | 0.24                                                                              | 0.24                                                                              | 0.24                                                                              | 0.24                                                                              |                                                                                   | 0.68                                                                                | 0.68                                                                                |                                                                                     | 0.57                                                                                | 0.57                                                                                |                                                                                     |
| v/c Ratio               |                                                                                   | 0.05                                                                              | 0.94                                                                              | 0.58                                                                              | 0.21                                                                              |                                                                                   | 0.59                                                                                | 0.34                                                                                |                                                                                     | 0.07                                                                                | 0.96                                                                                |                                                                                     |
| Control Delay           |                                                                                   | 28.9                                                                              | 53.8                                                                              | 40.9                                                                              | 9.4                                                                               |                                                                                   | 34.0                                                                                | 4.6                                                                                 |                                                                                     | 4.6                                                                                 | 13.0                                                                                |                                                                                     |
| Queue Delay             |                                                                                   | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                                 | 0.0                                                                                 |                                                                                     | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |
| Total Delay             |                                                                                   | 28.9                                                                              | 53.8                                                                              | 40.9                                                                              | 9.4                                                                               |                                                                                   | 34.0                                                                                | 4.6                                                                                 |                                                                                     | 4.6                                                                                 | 13.0                                                                                |                                                                                     |
| LOS                     |                                                                                   | C                                                                                 | D                                                                                 | D                                                                                 | A                                                                                 |                                                                                   | C                                                                                   | A                                                                                   |                                                                                     | A                                                                                   | B                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 52.9                                                                              |                                                                                   |                                                                                   | 30.4                                                                              |                                                                                   |                                                                                     | 8.4                                                                                 |                                                                                     |                                                                                     | 12.9                                                                                |                                                                                     |
| Approach LOS            |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | C                                                                                 |                                                                                   |                                                                                     | A                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| Queue Length 50th (ft)  |                                                                                   | 8                                                                                 | 201                                                                               | 106                                                                               | 5                                                                                 |                                                                                   | 24                                                                                  | 38                                                                                  |                                                                                     | 4                                                                                   | 335                                                                                 |                                                                                     |
| Queue Length 95th (ft)  |                                                                                   | 26                                                                                | #396                                                                              | 180                                                                               | 45                                                                                |                                                                                   | 66                                                                                  | 68                                                                                  |                                                                                     | m3                                                                                  | m215                                                                                |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 552                                                                               |                                                                                   |                                                                                   | 857                                                                               |                                                                                   |                                                                                    | 702                                                                                 |                                                                                     |                                                                                     | 1228                                                                                |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   | 200                                                                               | 200                                                                               |                                                                                   |                                                                                   | 530                                                                                |                                                                                     |                                                                                     | 215                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     |                                                                                   | 387                                                                               | 509                                                                               | 350                                                                               | 471                                                                               |                                                                                   | 216                                                                                | 2365                                                                                |                                                                                     | 336                                                                                 | 2021                                                                                |                                                                                     |
| Starvation Cap Reductn  |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       |                                                                                   | 0.04                                                                              | 0.90                                                                              | 0.55                                                                              | 0.20                                                                              |                                                                                   | 0.54                                                                               | 0.34                                                                                |                                                                                     | 0.07                                                                                | 0.96                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 98 (98%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.96

Intersection Signal Delay: 18.4

Intersection LOS: B

Intersection Capacity Utilization 95.4%

ICU Level of Service F

Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Trenton Dr & Centennial Rd

|                                                                                        |                                                                                        |                                                                                          |
|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
|  ø2 |  ø1 |  ø4 |
| 59 s                                                                                   | 12 s                                                                                   | 29 s                                                                                     |
|  ø6 |                                                                                        |  ø8 |
| 71 s                                                                                   |                                                                                        | 29 s                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |  |  |  |  |  |  |                                                                                     |  |  |  |
| Volume (vph)            | 47                                                                                | 64                                                                                | 415                                                                               | 1147                                                                              | 475                                                                               | 62                                                                                | 182                                                                                 | 399                                                                                 | 38                                                                                  | 44                                                                                  | 1921                                                                                | 173                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                                 |                                                                                     | 0                                                                                   | 215                                                                                 |                                                                                     | 215                                                                                 |
| Storage Lanes           | 1                                                                                 |                                                                                   | 1                                                                                 | 2                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                   |                                                                                     | 0                                                                                   | 1                                                                                   |                                                                                     | 1                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                  |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 35                                                                                |                                                                                   |                                                                                   | 35                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 505                                                                               |                                                                                   |                                                                                   | 579                                                                               |                                                                                   |                                                                                     | 1308                                                                                |                                                                                     |                                                                                     | 512                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 9.8                                                                               |                                                                                   |                                                                                   | 11.3                                                                              |                                                                                   |                                                                                     | 22.3                                                                                |                                                                                     |                                                                                     | 8.7                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 51                                                                                | 70                                                                                | 451                                                                               | 1247                                                                              | 516                                                                               | 67                                                                                | 198                                                                                 | 475                                                                                 | 0                                                                                   | 48                                                                                  | 2088                                                                                | 188                                                                                 |
| Turn Type               | pm+pt                                                                             |                                                                                   | Perm                                                                              | pm+pt                                                                             |                                                                                   | Perm                                                                              | pm+pt                                                                               |                                                                                     |                                                                                     | pm+pt                                                                               |                                                                                     | Perm                                                                                |
| Protected Phases        | 7                                                                                 | 4                                                                                 |                                                                                   | 3                                                                                 | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     | 2                                                                                   |
| Detector Phase          | 7                                                                                 | 4                                                                                 | 4                                                                                 | 3                                                                                 | 8                                                                                 | 8                                                                                 | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   | 2                                                                                   |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 4.0                                                                               | 10.0                                                                              | 10.0                                                                              | 4.0                                                                               | 10.0                                                                              | 10.0                                                                              | 4.0                                                                                 | 6.0                                                                                 |                                                                                     | 4.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 |
| Minimum Split (s)       | 8.0                                                                               | 15.7                                                                              | 15.7                                                                              | 8.0                                                                               | 15.7                                                                              | 15.7                                                                              | 8.0                                                                                 | 11.5                                                                                |                                                                                     | 8.0                                                                                 | 11.5                                                                                | 11.5                                                                                |
| Total Split (s)         | 12.0                                                                              | 23.0                                                                              | 23.0                                                                              | 22.0                                                                              | 33.0                                                                              | 33.0                                                                              | 12.0                                                                                | 43.0                                                                                | 0.0                                                                                 | 12.0                                                                                | 43.0                                                                                | 43.0                                                                                |
| Total Split (%)         | 12.0%                                                                             | 23.0%                                                                             | 23.0%                                                                             | 22.0%                                                                             | 33.0%                                                                             | 33.0%                                                                             | 12.0%                                                                               | 43.0%                                                                               | 0.0%                                                                                | 12.0%                                                                               | 43.0%                                                                               | 43.0%                                                                               |
| Yellow Time (s)         | 3.5                                                                               | 3.9                                                                               | 3.9                                                                               | 3.5                                                                               | 3.9                                                                               | 3.9                                                                               | 3.5                                                                                 | 3.6                                                                                 |                                                                                     | 3.5                                                                                 | 3.6                                                                                 | 3.6                                                                                 |
| All-Red Time (s)        | 0.5                                                                               | 1.8                                                                               | 1.8                                                                               | 0.5                                                                               | 1.8                                                                               | 1.8                                                                               | 0.5                                                                                 | 1.9                                                                                 |                                                                                     | 0.5                                                                                 | 1.9                                                                                 | 1.9                                                                                 |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 5.7                                                                               | 5.7                                                                               | 4.0                                                                               | 5.7                                                                               | 5.7                                                                               | 4.0                                                                                 | 5.5                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 5.5                                                                                 | 5.5                                                                                 |
| Lead/Lag                | Lead                                                                              | Lag                                                                               | Lag                                                                               | Lead                                                                              | Lag                                                                               | Lag                                                                               | Lag                                                                                 | Lag                                                                                 |                                                                                     | Lead                                                                                | Lead                                                                                | Lead                                                                                |
| Lead-Lag Optimize?      | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                                 | Yes                                                                                 |                                                                                     | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 |
| Recall Mode             | None                                                                              | Max                                                                               | Max                                                                               | None                                                                              | Max                                                                               | Max                                                                               | None                                                                                | C-Max                                                                               |                                                                                     | None                                                                                | C-Max                                                                               | C-Max                                                                               |
| Act Effect Green (s)    | 26.0                                                                              | 17.3                                                                              | 17.3                                                                              | 41.0                                                                              | 30.2                                                                              | 30.2                                                                              | 44.0                                                                                | 42.5                                                                                |                                                                                     | 39.0                                                                                | 37.5                                                                                | 37.5                                                                                |
| Actuated g/C Ratio      | 0.26                                                                              | 0.17                                                                              | 0.17                                                                              | 0.41                                                                              | 0.30                                                                              | 0.30                                                                              | 0.44                                                                                | 0.42                                                                                |                                                                                     | 0.39                                                                                | 0.38                                                                                | 0.38                                                                                |
| v/c Ratio               | 0.18                                                                              | 0.11                                                                              | 1.17                                                                              | 1.13                                                                              | 0.48                                                                              | 0.13                                                                              | 0.88                                                                                | 0.32                                                                                |                                                                                     | 0.14                                                                                | 1.57                                                                                | 0.29                                                                                |
| Control Delay           | 20.7                                                                              | 35.5                                                                              | 130.3                                                                             | 98.9                                                                              | 31.3                                                                              | 7.8                                                                               | 63.8                                                                                | 14.1                                                                                |                                                                                     | 20.3                                                                                | 288.2                                                                               | 12.1                                                                                |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 |                                                                                     | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             | 20.7                                                                              | 35.5                                                                              | 130.3                                                                             | 98.9                                                                              | 31.3                                                                              | 7.8                                                                               | 63.8                                                                                | 14.1                                                                                |                                                                                     | 20.3                                                                                | 288.2                                                                               | 12.1                                                                                |
| LOS                     | C                                                                                 | D                                                                                 | F                                                                                 | F                                                                                 | C                                                                                 | A                                                                                 | E                                                                                   | B                                                                                   |                                                                                     | C                                                                                   | F                                                                                   | B                                                                                   |
| Approach Delay          |                                                                                   | 109.0                                                                             |                                                                                   |                                                                                   | 76.5                                                                              |                                                                                   |                                                                                     | 28.7                                                                                |                                                                                     |                                                                                     | 260.4                                                                               |                                                                                     |
| Approach LOS            |                                                                                   | F                                                                                 |                                                                                   |                                                                                   | E                                                                                 |                                                                                   |                                                                                     | C                                                                                   |                                                                                     |                                                                                     | F                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 19                                                                                | 20                                                                                | ~271                                                                              | ~445                                                                              | 145                                                                               | 0                                                                                 | 75                                                                                  | 80                                                                                  |                                                                                     | 19                                                                                  | ~1000                                                                               | 39                                                                                  |
| Queue Length 95th (ft)  | 43                                                                                | 40                                                                                | #467                                                                              | #608                                                                              | 200                                                                               | 32                                                                                | #231                                                                                | 100                                                                                 |                                                                                     | 42                                                                                  | #1138                                                                               | 89                                                                                  |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 425                                                                               |                                                                                   |                                                                                   | 499                                                                               |                                                                                   |                                                                                    | 1228                                                                                |                                                                                     |                                                                                     | 432                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                                |                                                                                     |                                                                                     | 215                                                                                 |                                                                                     | 215                                                                                 |
| Base Capacity (vph)     | 305                                                                               | 612                                                                               | 384                                                                               | 1101                                                                              | 1068                                                                              | 525                                                                               | 226                                                                                | 1490                                                                                |                                                                                     | 345                                                                                 | 1327                                                                                | 653                                                                                 |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       | 0.17                                                                              | 0.11                                                                              | 1.17                                                                              | 1.13                                                                              | 0.48                                                                              | 0.13                                                                              | 0.88                                                                               | 0.32                                                                                |                                                                                     | 0.14                                                                                | 1.57                                                                                | 0.29                                                                                |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 5 (5%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 150

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.57

Intersection Signal Delay: 153.1

Intersection LOS: F

Intersection Capacity Utilization 124.2%

ICU Level of Service H

Analysis Period (min) 15

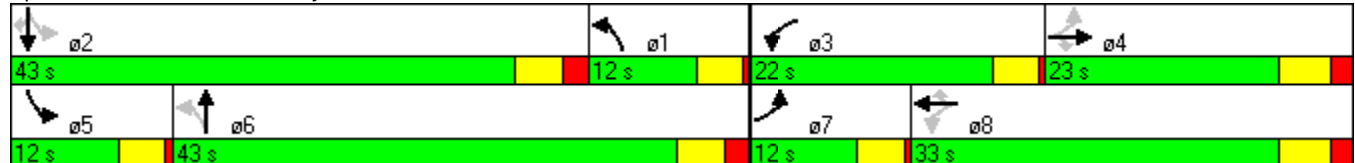
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 5: Century Ave & Centennial Rd





**Appendix CC: 2059 - Signal at Trenton & NE Loop Ramp PM (4C2)**

Exit 161 Operational Study  
Bismarck, ND

1: Divide Ave & Bismarck Expy

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |                                                                                   |  |  |  |  |  |  |  |  |  |
| Volume (vph)            | 408                                                                               | 80                                                                                | 35                                                                                | 213                                                                               | 174                                                                               | 778                                                                               | 32                                                                                  | 1148                                                                                | 81                                                                                  | 291                                                                                 | 1240                                                                                | 188                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 150                                                                               |                                                                                   | 0                                                                                 | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                 |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                   |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 100                                                                               |                                                                                   | 25                                                                                | 100                                                                               |                                                                                   | 100                                                                               | 100                                                                                 |                                                                                     | 150                                                                                 | 100                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 25                                                                                |                                                                                   |                                                                                   | 25                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 371                                                                               |                                                                                   |                                                                                   | 341                                                                               |                                                                                   |                                                                                     | 614                                                                                 |                                                                                     |                                                                                     | 458                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 10.1                                                                              |                                                                                   |                                                                                   | 9.3                                                                               |                                                                                   |                                                                                     | 10.5                                                                                |                                                                                     |                                                                                     | 7.8                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 4%                                                                                | 1%                                                                                | 1%                                                                                | 11%                                                                               | 10%                                                                               | 22%                                                                               | 10%                                                                                 | 7%                                                                                  | 17%                                                                                 | 11%                                                                                 | 4%                                                                                  | 4%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 443                                                                               | 125                                                                               | 0                                                                                 | 232                                                                               | 189                                                                               | 846                                                                               | 35                                                                                  | 1248                                                                                | 88                                                                                  | 316                                                                                 | 1552                                                                                | 0                                                                                   |
| Turn Type               | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                              |                                                                                   | pm+ov                                                                             | Perm                                                                                |                                                                                     | Perm                                                                                | pm+pt                                                                               |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 | 5                                                                                 |                                                                                     | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                   |                                                                                     | 6                                                                                   | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 | 4                                                                                 |                                                                                   | 8                                                                                 | 8                                                                                 | 5                                                                                 | 6                                                                                   | 6                                                                                   | 6                                                                                   | 5                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               | 6.0                                                                               |                                                                                   | 6.0                                                                               | 6.0                                                                               | 5.0                                                                               | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 5.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 30.0                                                                              | 30.0                                                                              |                                                                                   | 30.0                                                                              | 30.0                                                                              | 9.8                                                                               | 22.9                                                                                | 22.9                                                                                | 22.9                                                                                | 9.8                                                                                 | 28.7                                                                                |                                                                                     |
| Total Split (s)         | 40.0                                                                              | 40.0                                                                              | 0.0                                                                               | 40.0                                                                              | 40.0                                                                              | 21.0                                                                              | 39.0                                                                                | 39.0                                                                                | 39.0                                                                                | 21.0                                                                                | 60.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 40.0%                                                                             | 40.0%                                                                             | 0.0%                                                                              | 40.0%                                                                             | 40.0%                                                                             | 21.0%                                                                             | 39.0%                                                                               | 39.0%                                                                               | 39.0%                                                                               | 21.0%                                                                               | 60.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 3.0                                                                               | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 | 3.0                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 1.0                                                                               | 1.8                                                                                 | 1.8                                                                                 | 1.8                                                                                 | 1.0                                                                                 | 1.8                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 5.7                                                                                 | 5.7                                                                                 | 5.7                                                                                 | 4.0                                                                                 | 5.7                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lead                                                                              | Lag                                                                                 | Lag                                                                                 | Lag                                                                                 | Lead                                                                                |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                               | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 |                                                                                     |                                                                                     |
| Recall Mode             | None                                                                              | None                                                                              |                                                                                   | None                                                                              | None                                                                              | None                                                                              | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               | None                                                                                | C-Min                                                                               |                                                                                     |
| Act Effct Green (s)     | 34.0                                                                              | 34.0                                                                              |                                                                                   | 34.0                                                                              | 34.0                                                                              | 57.0                                                                              | 33.3                                                                                | 33.3                                                                                | 33.3                                                                                | 56.0                                                                                | 54.3                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.34                                                                              | 0.34                                                                              |                                                                                   | 0.34                                                                              | 0.34                                                                              | 0.57                                                                              | 0.33                                                                                | 0.33                                                                                | 0.33                                                                                | 0.56                                                                                | 0.54                                                                                |                                                                                     |
| v/c Ratio               | 1.18                                                                              | 0.20                                                                              |                                                                                   | 0.59                                                                              | 0.32                                                                              | 1.12                                                                              | 0.51                                                                                | 1.11                                                                                | 0.17                                                                                | 0.91                                                                                | 0.83                                                                                |                                                                                     |
| Control Delay           | 136.5                                                                             | 19.8                                                                              |                                                                                   | 34.6                                                                              | 26.4                                                                              | 93.3                                                                              | 56.3                                                                                | 95.2                                                                                | 9.9                                                                                 | 50.3                                                                                | 17.4                                                                                |                                                                                     |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                               | 0.0                                                                               | 16.9                                                                              | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 1.2                                                                                 |                                                                                     |
| Total Delay             | 136.5                                                                             | 19.8                                                                              |                                                                                   | 34.6                                                                              | 26.4                                                                              | 110.1                                                                             | 56.3                                                                                | 95.2                                                                                | 9.9                                                                                 | 50.3                                                                                | 18.6                                                                                |                                                                                     |
| LOS                     | F                                                                                 | B                                                                                 |                                                                                   | C                                                                                 | C                                                                                 | F                                                                                 | E                                                                                   | F                                                                                   | A                                                                                   | D                                                                                   | B                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 110.8                                                                             |                                                                                   |                                                                                   | 83.8                                                                              |                                                                                   |                                                                                     | 88.7                                                                                |                                                                                     |                                                                                     | 23.9                                                                                |                                                                                     |
| Approach LOS            |                                                                                   | F                                                                                 |                                                                                   |                                                                                   | F                                                                                 |                                                                                   |                                                                                     | F                                                                                   |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | ~340                                                                              | 45                                                                                |                                                                                   | 121                                                                               | 89                                                                                | ~624                                                                              | 18                                                                                  | ~481                                                                                | 10                                                                                  | 128                                                                                 | 362                                                                                 |                                                                                     |
| Queue Length 95th (ft)  | #531                                                                              | 88                                                                                |                                                                                   | 204                                                                               | 147                                                                               | #861                                                                              | #66                                                                                 | #614                                                                                | 45                                                                                  | m#285                                                                               | 412                                                                                 |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 291                                                                               |                                                                                   |                                                                                   | 261                                                                               |                                                                                   |                                                                                    | 534                                                                                 |                                                                                     |                                                                                     | 378                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 150                                                                               |                                                                                   |                                                                                   | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 376                                                                               | 626                                                                               |                                                                                   | 394                                                                               | 587                                                                               | 757                                                                               | 69                                                                                 | 1124                                                                                | 503                                                                                 | 348                                                                                 | 1859                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 133                                                                                 |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 26                                                                                | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 1.18                                                                              | 0.20                                                                              |                                                                                   | 0.59                                                                              | 0.32                                                                              | 1.16                                                                              | 0.51                                                                               | 1.11                                                                                | 0.17                                                                                | 0.91                                                                                | 0.90                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 20 (20%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.18

Intersection Signal Delay: 66.1

Intersection LOS: E

Intersection Capacity Utilization 115.6%

ICU Level of Service H

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

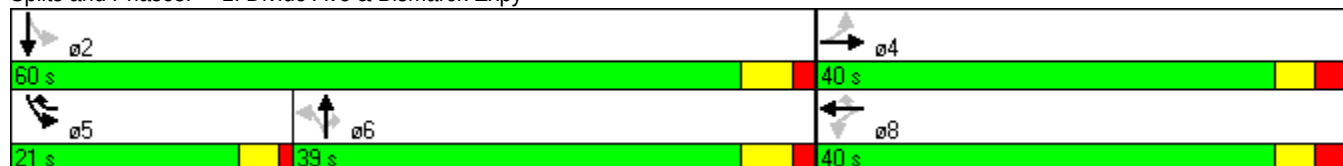
Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Divide Ave & Bismarck Expy



|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |                                                                                   |  |                                                                                   |                                                                                   |                                                                                   |                                                                                    |  |  |  |  |                                                                                     |
| Volume (vph)            | 418                                                                               | 0                                                                                 | 561                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 1862                                                                                | 182                                                                                 | 46                                                                                  | 939                                                                                 | 0                                                                                   |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                 | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 200                                                                               |                                                                                   | 200                                                                               | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  |                                                                                     | 0                                                                                   | 222                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 2                                                                                 |                                                                                   | 2                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 300                                                                               | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                 |                                                                                     | 25                                                                                  | 150                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                    |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                    | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 575                                                                               |                                                                                   |                                                                                   | 383                                                                               |                                                                                   |                                                                                    | 458                                                                                 |                                                                                     |                                                                                     | 769                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 13.1                                                                              |                                                                                   |                                                                                   | 8.7                                                                               |                                                                                   |                                                                                    | 7.8                                                                                 |                                                                                     |                                                                                     | 13.1                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                               | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                               | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 3%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                 | 8%                                                                                  | 27%                                                                                 | 10%                                                                                 | 9%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 454                                                                               | 0                                                                                 | 610                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 2024                                                                                | 198                                                                                 | 50                                                                                  | 1021                                                                                | 0                                                                                   |
| Turn Type               | custom                                                                            |                                                                                   | custom                                                                            |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     | Perm                                                                                | Perm                                                                                |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     | 6                                                                                   | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                   | 6                                                                                   | 2                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               |                                                                                   | 6.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 21.1                                                                              |                                                                                   | 21.1                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 23.4                                                                                | 23.4                                                                                | 21.4                                                                                | 21.4                                                                                |                                                                                     |
| Total Split (s)         | 24.0                                                                              | 0.0                                                                               | 24.0                                                                              | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 76.0                                                                                | 76.0                                                                                | 76.0                                                                                | 76.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 24.0%                                                                             | 0.0%                                                                              | 24.0%                                                                             | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                               | 76.0%                                                                               | 76.0%                                                                               | 76.0%                                                                               | 76.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.6                                                                               |                                                                                   | 3.6                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 1.5                                                                               |                                                                                   | 1.5                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 1.5                                                                                 | 1.5                                                                                 | 1.5                                                                                 | 1.5                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 5.1                                                                               | 4.0                                                                               | 5.1                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                                | 5.4                                                                                 | 5.4                                                                                 | 5.4                                                                                 | 5.4                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Recall Mode             | None                                                                              |                                                                                   | None                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               |                                                                                     |
| Act Effct Green (s)     | 17.8                                                                              |                                                                                   | 17.8                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 71.7                                                                                | 71.7                                                                                | 71.7                                                                                | 71.7                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.18                                                                              |                                                                                   | 0.18                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.72                                                                                | 0.72                                                                                | 0.72                                                                                | 0.72                                                                                |                                                                                     |
| v/c Ratio               | 0.75                                                                              |                                                                                   | 0.83                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.84                                                                                | 0.20                                                                                | 0.72                                                                                | 0.43                                                                                |                                                                                     |
| Control Delay           | 47.4                                                                              |                                                                                   | 31.7                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 8.6                                                                                 | 0.8                                                                                 | 67.1                                                                                | 7.6                                                                                 |                                                                                     |
| Queue Delay             | 0.0                                                                               |                                                                                   | 0.7                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 12.2                                                                                | 0.0                                                                                 | 0.0                                                                                 | 0.1                                                                                 |                                                                                     |
| Total Delay             | 47.4                                                                              |                                                                                   | 32.4                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 20.8                                                                                | 0.8                                                                                 | 67.1                                                                                | 7.6                                                                                 |                                                                                     |
| LOS                     | D                                                                                 |                                                                                   | C                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | C                                                                                   | A                                                                                   | E                                                                                   | A                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 19.0                                                                                |                                                                                     |                                                                                     | 10.4                                                                                |                                                                                     |
| Approach LOS            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | B                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 140                                                                               |                                                                                   | 113                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 327                                                                                 | 3                                                                                   | 17                                                                                  | 110                                                                                 |                                                                                     |
| Queue Length 95th (ft)  | 195                                                                               |                                                                                   | #193                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | m275                                                                                | m0                                                                                  | m#98                                                                                | 122                                                                                 |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 495                                                                               |                                                                                   |                                                                                   | 303                                                                               |                                                                                   |                                                                                    | 378                                                                                 |                                                                                     |                                                                                     | 689                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 200                                                                               |                                                                                   | 200                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | 222                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 643                                                                               |                                                                                   | 760                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 2398                                                                                | 968                                                                                 | 69                                                                                  | 2376                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 393                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 |                                                                                   | 26                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 301                                                                                 |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.71                                                                              |                                                                                   | 0.83                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 1.01                                                                                | 0.20                                                                                | 0.72                                                                                | 0.49                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 92 (92%), Referenced to phase 2:SBTL and 6:NBT, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.84

Intersection Signal Delay: 21.7

Intersection LOS: C

Intersection Capacity Utilization 71.2%

ICU Level of Service C

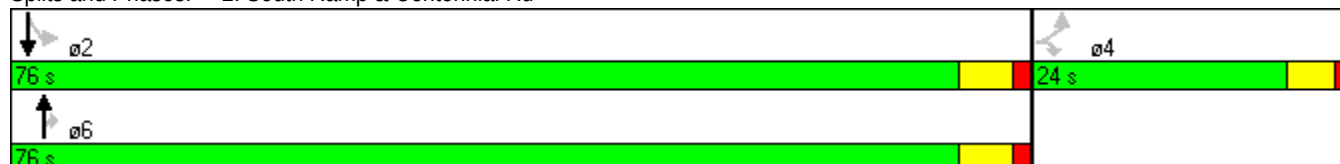
Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: South Ramp & Centennial Rd



|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |                                                                                   |                                                                                   |                                                                                   |  |                                                                                   |  |                                                                                    |  |  |                                                                                     |  |  |
| Volume (vph)            | 0                                                                                 | 0                                                                                 | 0                                                                                 | 210                                                                               | 0                                                                                 | 45                                                                                | 0                                                                                  | 1424                                                                                | 501                                                                                 | 0                                                                                   | 838                                                                                 | 233                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 16                                                                                | 12                                                                                | 12                                                                                | 12                                                                                 | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 150                                                                               | 0                                                                                  |                                                                                     | 215                                                                                 | 0                                                                                   |                                                                                     | 200                                                                                 |
| Storage Lanes           | 0                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                 |                                                                                   | 1                                                                                 | 0                                                                                  |                                                                                     | 1                                                                                   | 0                                                                                   |                                                                                     | 1                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 100                                                                               | 150                                                                                |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                    |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                    | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 270                                                                               |                                                                                   |                                                                                   | 465                                                                               |                                                                                   |                                                                                    | 769                                                                                 |                                                                                     |                                                                                     | 788                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 6.1                                                                               |                                                                                   |                                                                                   | 10.6                                                                              |                                                                                   |                                                                                    | 13.1                                                                                |                                                                                     |                                                                                     | 13.4                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                               | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                               | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                | 2%                                                                                | 2%                                                                                | 12%                                                                               | 2%                                                                                | 8%                                                                                | 6%                                                                                 | 3%                                                                                  | 2%                                                                                  | 2%                                                                                  | 3%                                                                                  | 1%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 228                                                                               | 0                                                                                 | 49                                                                                | 0                                                                                  | 1548                                                                                | 545                                                                                 | 0                                                                                   | 911                                                                                 | 253                                                                                 |
| Turn Type               |                                                                                   |                                                                                   |                                                                                   | custom                                                                            |                                                                                   | custom                                                                            |                                                                                    |                                                                                     | Free                                                                                |                                                                                     |                                                                                     | Perm                                                                                |
| Protected Phases        |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        |                                                                                   |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 8                                                                                 |                                                                                    |                                                                                     | Free                                                                                |                                                                                     |                                                                                     | 2                                                                                   |
| Detector Phase          |                                                                                   |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 8                                                                                 |                                                                                    | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   | 2                                                                                   |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     |                                                                                   |                                                                                   |                                                                                   | 5.0                                                                               |                                                                                   | 5.0                                                                               |                                                                                    | 10.0                                                                                |                                                                                     |                                                                                     | 10.0                                                                                | 10.0                                                                                |
| Minimum Split (s)       |                                                                                   |                                                                                   |                                                                                   | 20.0                                                                              |                                                                                   | 20.0                                                                              |                                                                                    | 20.0                                                                                |                                                                                     |                                                                                     | 22.4                                                                                | 22.4                                                                                |
| Total Split (s)         | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 29.0                                                                              | 0.0                                                                               | 29.0                                                                              | 0.0                                                                                | 71.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 71.0                                                                                | 71.0                                                                                |
| Total Split (%)         | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                              | 29.0%                                                                             | 0.0%                                                                              | 29.0%                                                                             | 0.0%                                                                               | 71.0%                                                                               | 0.0%                                                                                | 0.0%                                                                                | 71.0%                                                                               | 71.0%                                                                               |
| Yellow Time (s)         |                                                                                   |                                                                                   |                                                                                   | 3.2                                                                               |                                                                                   | 3.2                                                                               |                                                                                    | 3.9                                                                                 |                                                                                     |                                                                                     | 3.9                                                                                 | 3.9                                                                                 |
| All-Red Time (s)        |                                                                                   |                                                                                   |                                                                                   | 2.0                                                                               |                                                                                   | 2.0                                                                               |                                                                                    | 1.5                                                                                 |                                                                                     |                                                                                     | 1.5                                                                                 | 1.5                                                                                 |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 5.2                                                                               | 4.0                                                                               | 5.2                                                                               | 4.0                                                                                | 5.4                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 5.4                                                                                 | 5.4                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Recall Mode             |                                                                                   |                                                                                   |                                                                                   | None                                                                              |                                                                                   | None                                                                              |                                                                                    | C-Min                                                                               |                                                                                     |                                                                                     | C-Min                                                                               | C-Min                                                                               |
| Act Effect Green (s)    |                                                                                   |                                                                                   |                                                                                   | 16.8                                                                              |                                                                                   | 16.8                                                                              |                                                                                    | 72.6                                                                                | 100.0                                                                               |                                                                                     | 72.6                                                                                | 72.6                                                                                |
| Actuated g/C Ratio      |                                                                                   |                                                                                   |                                                                                   | 0.17                                                                              |                                                                                   | 0.17                                                                              |                                                                                    | 0.73                                                                                | 1.00                                                                                |                                                                                     | 0.73                                                                                | 0.73                                                                                |
| v/c Ratio               |                                                                                   |                                                                                   |                                                                                   | 0.75                                                                              |                                                                                   | 0.17                                                                              |                                                                                    | 0.61                                                                                | 0.34                                                                                |                                                                                     | 0.36                                                                                | 0.21                                                                                |
| Control Delay           |                                                                                   |                                                                                   |                                                                                   | 53.9                                                                              |                                                                                   | 12.0                                                                              |                                                                                    | 6.1                                                                                 | 0.3                                                                                 |                                                                                     | 6.4                                                                                 | 2.2                                                                                 |
| Queue Delay             |                                                                                   |                                                                                   |                                                                                   | 0.0                                                                               |                                                                                   | 0.0                                                                               |                                                                                    | 0.2                                                                                 | 0.0                                                                                 |                                                                                     | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             |                                                                                   |                                                                                   |                                                                                   | 53.9                                                                              |                                                                                   | 12.0                                                                              |                                                                                    | 6.3                                                                                 | 0.3                                                                                 |                                                                                     | 6.4                                                                                 | 2.2                                                                                 |
| LOS                     |                                                                                   |                                                                                   |                                                                                   | D                                                                                 |                                                                                   | B                                                                                 |                                                                                    | A                                                                                   | A                                                                                   |                                                                                     | A                                                                                   | A                                                                                   |
| Approach Delay          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 4.7                                                                                 |                                                                                     |                                                                                     | 5.5                                                                                 |                                                                                     |
| Approach LOS            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | A                                                                                   |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |
| Queue Length 50th (ft)  |                                                                                   |                                                                                   |                                                                                   | 140                                                                               |                                                                                   | 2                                                                                 |                                                                                    | 142                                                                                 | 0                                                                                   |                                                                                     | 121                                                                                 | 16                                                                                  |
| Queue Length 95th (ft)  |                                                                                   |                                                                                   |                                                                                   | 205                                                                               |                                                                                   | 31                                                                                |                                                                                    | 276                                                                                 | m0                                                                                  |                                                                                     | m145                                                                                | m31                                                                                 |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 190                                                                               |                                                                                   |                                                                                   | 385                                                                               |                                                                                   |                                                                                    | 689                                                                                 |                                                                                     |                                                                                     | 708                                                                                 |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 150                                                                               |                                                                                    |                                                                                     | 215                                                                                 |                                                                                     |                                                                                     | 200                                                                                 |
| Base Capacity (vph)     |                                                                                   |                                                                                   |                                                                                   | 435                                                                               |                                                                                   | 391                                                                               |                                                                                    | 2545                                                                                | 1583                                                                                |                                                                                     | 2545                                                                                | 1230                                                                                |
| Starvation Cap Reductn  |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                    | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 4                                                                                 |                                                                                    | 318                                                                                 | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                    | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       |                                                                                   |                                                                                   |                                                                                   | 0.52                                                                              |                                                                                   | 0.13                                                                              |                                                                                    | 0.70                                                                                | 0.34                                                                                |                                                                                     | 0.36                                                                                | 0.21                                                                                |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 12 (12%), Referenced to phase 2:SBT and 6:NBT, Start of Green

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.75

Intersection Signal Delay: 8.3

Intersection LOS: A

Intersection Capacity Utilization 58.8%

ICU Level of Service B

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: North Ramp & Centennial Rd



|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |                                                                                   |  |  |  |  |                                                                                   |  |  |                                                                                     |  |  |                                                                                     |
| Volume (vph)            | 28                                                                                | 5                                                                                 | 170                                                                               | 236                                                                               | 2                                                                                 | 149                                                                               | 194                                                                                 | 2017                                                                                | 365                                                                                 | 51                                                                                  | 800                                                                                 | 22                                                                                  |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 0                                                                                 |                                                                                   | 200                                                                               | 200                                                                               |                                                                                   | 200                                                                               | 530                                                                                 |                                                                                     | 0                                                                                   | 215                                                                                 |                                                                                     | 150                                                                                 |
| Storage Lanes           | 0                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                   |                                                                                     | 0                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                  |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 604                                                                               |                                                                                   |                                                                                   | 932                                                                               |                                                                                   |                                                                                     | 788                                                                                 |                                                                                     |                                                                                     | 1302                                                                                |                                                                                     |
| Travel Time (s)         |                                                                                   | 13.7                                                                              |                                                                                   |                                                                                   | 21.2                                                                              |                                                                                   |                                                                                     | 13.4                                                                                |                                                                                     |                                                                                     | 22.2                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 0                                                                                 | 35                                                                                | 185                                                                               | 257                                                                               | 164                                                                               | 0                                                                                 | 211                                                                                 | 2589                                                                                | 0                                                                                   | 55                                                                                  | 894                                                                                 | 0                                                                                   |
| Turn Type               | Perm                                                                              |                                                                                   | Perm                                                                              | Perm                                                                              |                                                                                   |                                                                                   | pm+pt                                                                               |                                                                                     |                                                                                     | pm+pt                                                                               |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 | 8                                                                                 |                                                                                   |                                                                                   | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 | 4                                                                                 | 4                                                                                 | 8                                                                                 | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               |                                                                                   | 5.0                                                                                 | 4.0                                                                                 |                                                                                     | 5.0                                                                                 | 4.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              |                                                                                   | 9.0                                                                                 | 20.0                                                                                |                                                                                     | 9.0                                                                                 | 20.0                                                                                |                                                                                     |
| Total Split (s)         | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 0.0                                                                               | 16.0                                                                                | 68.0                                                                                | 0.0                                                                                 | 12.0                                                                                | 64.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 20.0%                                                                             | 20.0%                                                                             | 20.0%                                                                             | 20.0%                                                                             | 20.0%                                                                             | 0.0%                                                                              | 16.0%                                                                               | 68.0%                                                                               | 0.0%                                                                                | 12.0%                                                                               | 64.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               |                                                                                   | 3.5                                                                                 | 3.5                                                                                 |                                                                                     | 3.5                                                                                 | 3.5                                                                                 |                                                                                     |
| All-Red Time (s)        | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               |                                                                                   | 0.5                                                                                 | 0.5                                                                                 |                                                                                     | 0.5                                                                                 | 0.5                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lead                                                                                | Lead                                                                                |                                                                                     | Lag                                                                                 | Lag                                                                                 |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                                 | Yes                                                                                 |                                                                                     | Yes                                                                                 | Yes                                                                                 |                                                                                     |
| Recall Mode             | None                                                                              | None                                                                              | None                                                                              | None                                                                              | None                                                                              |                                                                                   | None                                                                                | C-Min                                                                               |                                                                                     | None                                                                                | C-Min                                                                               |                                                                                     |
| Act Effct Green (s)     |                                                                                   | 19.1                                                                              | 19.1                                                                              | 19.1                                                                              | 19.1                                                                              |                                                                                   | 64.0                                                                                | 64.0                                                                                |                                                                                     | 59.8                                                                                | 58.7                                                                                |                                                                                     |
| Actuated g/C Ratio      |                                                                                   | 0.19                                                                              | 0.19                                                                              | 0.19                                                                              | 0.19                                                                              |                                                                                   | 0.64                                                                                | 0.64                                                                                |                                                                                     | 0.60                                                                                | 0.59                                                                                |                                                                                     |
| v/c Ratio               |                                                                                   | 0.13                                                                              | 0.41                                                                              | 0.98                                                                              | 0.40                                                                              |                                                                                   | 0.51                                                                                | 1.16                                                                                |                                                                                     | 0.28                                                                                | 0.43                                                                                |                                                                                     |
| Control Delay           |                                                                                   | 37.4                                                                              | 8.7                                                                               | 94.9                                                                              | 12.9                                                                              |                                                                                   | 8.5                                                                                 | 95.0                                                                                |                                                                                     | 13.6                                                                                | 6.5                                                                                 |                                                                                     |
| Queue Delay             |                                                                                   | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                                 | 0.0                                                                                 |                                                                                     | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |
| Total Delay             |                                                                                   | 37.4                                                                              | 8.7                                                                               | 94.9                                                                              | 12.9                                                                              |                                                                                   | 8.5                                                                                 | 95.0                                                                                |                                                                                     | 13.6                                                                                | 6.5                                                                                 |                                                                                     |
| LOS                     |                                                                                   | D                                                                                 | A                                                                                 | F                                                                                 | B                                                                                 |                                                                                   | A                                                                                   | F                                                                                   |                                                                                     | B                                                                                   | A                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 13.3                                                                              |                                                                                   |                                                                                   | 63.0                                                                              |                                                                                   |                                                                                     | 88.5                                                                                |                                                                                     |                                                                                     | 6.9                                                                                 |                                                                                     |
| Approach LOS            |                                                                                   | B                                                                                 |                                                                                   |                                                                                   | E                                                                                 |                                                                                   |                                                                                     | F                                                                                   |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |
| Queue Length 50th (ft)  |                                                                                   | 19                                                                                | 0                                                                                 | ~184                                                                              | 15                                                                                |                                                                                   | 23                                                                                  | ~1030                                                                               |                                                                                     | 7                                                                                   | 58                                                                                  |                                                                                     |
| Queue Length 95th (ft)  |                                                                                   | 48                                                                                | 59                                                                                | #353                                                                              | 74                                                                                |                                                                                   | 37                                                                                  | #1170                                                                               |                                                                                     | m13                                                                                 | 59                                                                                  |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 524                                                                               |                                                                                   |                                                                                   | 852                                                                               |                                                                                   |                                                                                    | 708                                                                                 |                                                                                     |                                                                                     | 1222                                                                                |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   | 200                                                                               | 200                                                                               |                                                                                   |                                                                                   | 530                                                                                |                                                                                     |                                                                                     | 215                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     |                                                                                   | 263                                                                               | 453                                                                               | 262                                                                               | 414                                                                               |                                                                                   | 436                                                                                | 2228                                                                                |                                                                                     | 216                                                                                 | 2126                                                                                |                                                                                     |
| Starvation Cap Reductn  |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       |                                                                                   | 0.13                                                                              | 0.41                                                                              | 0.98                                                                              | 0.40                                                                              |                                                                                   | 0.48                                                                               | 1.16                                                                                |                                                                                     | 0.25                                                                                | 0.42                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 39 (39%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 150

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.16

Intersection Signal Delay: 64.6

Intersection LOS: E

Intersection Capacity Utilization 101.3%

ICU Level of Service G

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Trenton Dr & Centennial Rd



|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |  |  |  |  |  |  |                                                                                     |  |  |  |
| Volume (vph)            | 149                                                                               | 459                                                                               | 387                                                                               | 235                                                                               | 189                                                                               | 46                                                                                | 252                                                                                 | 798                                                                                 | 343                                                                                 | 78                                                                                  | 534                                                                                 | 66                                                                                  |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                                 |                                                                                     | 0                                                                                   | 215                                                                                 |                                                                                     | 215                                                                                 |
| Storage Lanes           | 1                                                                                 |                                                                                   | 1                                                                                 | 2                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                   |                                                                                     | 0                                                                                   | 1                                                                                   |                                                                                     | 1                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                  |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 35                                                                                |                                                                                   |                                                                                   | 35                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 637                                                                               |                                                                                   |                                                                                   | 607                                                                               |                                                                                   |                                                                                     | 1302                                                                                |                                                                                     |                                                                                     | 516                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 12.4                                                                              |                                                                                   |                                                                                   | 11.8                                                                              |                                                                                   |                                                                                     | 22.2                                                                                |                                                                                     |                                                                                     | 8.8                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 162                                                                               | 499                                                                               | 421                                                                               | 255                                                                               | 205                                                                               | 50                                                                                | 274                                                                                 | 1240                                                                                | 0                                                                                   | 85                                                                                  | 580                                                                                 | 72                                                                                  |
| Turn Type               | pm+pt                                                                             |                                                                                   | Perm                                                                              | pm+pt                                                                             |                                                                                   | Perm                                                                              | pm+pt                                                                               |                                                                                     |                                                                                     | pm+pt                                                                               |                                                                                     | Perm                                                                                |
| Protected Phases        | 7                                                                                 | 4                                                                                 |                                                                                   | 3                                                                                 | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     | 2                                                                                   |
| Detector Phase          | 7                                                                                 | 4                                                                                 | 4                                                                                 | 3                                                                                 | 8                                                                                 | 8                                                                                 | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   | 2                                                                                   |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 4.0                                                                               | 10.0                                                                              | 10.0                                                                              | 4.0                                                                               | 10.0                                                                              | 10.0                                                                              | 4.0                                                                                 | 6.0                                                                                 |                                                                                     | 4.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 |
| Minimum Split (s)       | 8.0                                                                               | 15.7                                                                              | 15.7                                                                              | 8.0                                                                               | 15.7                                                                              | 15.7                                                                              | 8.0                                                                                 | 11.5                                                                                |                                                                                     | 8.0                                                                                 | 11.5                                                                                | 11.5                                                                                |
| Total Split (s)         | 13.0                                                                              | 24.0                                                                              | 24.0                                                                              | 13.0                                                                              | 24.0                                                                              | 24.0                                                                              | 19.0                                                                                | 51.0                                                                                | 0.0                                                                                 | 12.0                                                                                | 44.0                                                                                | 44.0                                                                                |
| Total Split (%)         | 13.0%                                                                             | 24.0%                                                                             | 24.0%                                                                             | 13.0%                                                                             | 24.0%                                                                             | 24.0%                                                                             | 19.0%                                                                               | 51.0%                                                                               | 0.0%                                                                                | 12.0%                                                                               | 44.0%                                                                               | 44.0%                                                                               |
| Yellow Time (s)         | 3.5                                                                               | 3.9                                                                               | 3.9                                                                               | 3.5                                                                               | 3.9                                                                               | 3.9                                                                               | 3.5                                                                                 | 3.6                                                                                 |                                                                                     | 3.5                                                                                 | 3.6                                                                                 | 3.6                                                                                 |
| All-Red Time (s)        | 0.5                                                                               | 1.8                                                                               | 1.8                                                                               | 0.5                                                                               | 1.8                                                                               | 1.8                                                                               | 0.5                                                                                 | 1.9                                                                                 |                                                                                     | 0.5                                                                                 | 1.9                                                                                 | 1.9                                                                                 |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 5.7                                                                               | 5.7                                                                               | 4.0                                                                               | 5.7                                                                               | 5.7                                                                               | 4.0                                                                                 | 5.5                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 5.5                                                                                 | 5.5                                                                                 |
| Lead/Lag                | Lead                                                                              | Lag                                                                               | Lag                                                                               | Lead                                                                              | Lag                                                                               | Lag                                                                               | Lag                                                                                 | Lag                                                                                 |                                                                                     | Lead                                                                                | Lead                                                                                | Lead                                                                                |
| Lead-Lag Optimize?      | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                                 | Yes                                                                                 |                                                                                     | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 |
| Recall Mode             | None                                                                              | Max                                                                               | Max                                                                               | None                                                                              | Max                                                                               | Max                                                                               | None                                                                                | C-Max                                                                               |                                                                                     | None                                                                                | C-Max                                                                               | C-Max                                                                               |
| Act Effect Green (s)    | 28.8                                                                              | 18.3                                                                              | 18.3                                                                              | 28.9                                                                              | 18.3                                                                              | 18.3                                                                              | 49.7                                                                                | 48.2                                                                                |                                                                                     | 40.2                                                                                | 38.7                                                                                | 38.7                                                                                |
| Actuated g/C Ratio      | 0.29                                                                              | 0.18                                                                              | 0.18                                                                              | 0.29                                                                              | 0.18                                                                              | 0.18                                                                              | 0.50                                                                                | 0.48                                                                                |                                                                                     | 0.40                                                                                | 0.39                                                                                | 0.39                                                                                |
| v/c Ratio               | 0.42                                                                              | 0.77                                                                              | 0.71                                                                              | 0.52                                                                              | 0.32                                                                              | 0.15                                                                              | 0.50                                                                                | 0.74                                                                                |                                                                                     | 0.41                                                                                | 0.42                                                                                | 0.11                                                                                |
| Control Delay           | 28.9                                                                              | 47.9                                                                              | 14.4                                                                              | 28.5                                                                              | 37.0                                                                              | 11.2                                                                              | 9.4                                                                                 | 6.9                                                                                 |                                                                                     | 25.0                                                                                | 23.7                                                                                | 5.3                                                                                 |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 |                                                                                     | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             | 28.9                                                                              | 47.9                                                                              | 14.4                                                                              | 28.5                                                                              | 37.0                                                                              | 11.2                                                                              | 9.4                                                                                 | 6.9                                                                                 |                                                                                     | 25.0                                                                                | 23.7                                                                                | 5.3                                                                                 |
| LOS                     | C                                                                                 | D                                                                                 | B                                                                                 | C                                                                                 | D                                                                                 | B                                                                                 | A                                                                                   | A                                                                                   |                                                                                     | C                                                                                   | C                                                                                   | A                                                                                   |
| Approach Delay          |                                                                                   | 32.0                                                                              |                                                                                   |                                                                                   | 30.2                                                                              |                                                                                   |                                                                                     | 7.4                                                                                 |                                                                                     |                                                                                     | 22.1                                                                                |                                                                                     |
| Approach LOS            |                                                                                   | C                                                                                 |                                                                                   |                                                                                   | C                                                                                 |                                                                                   |                                                                                     | A                                                                                   |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 76                                                                                | 161                                                                               | 30                                                                                | 60                                                                                | 60                                                                                | 0                                                                                 | 59                                                                                  | 200                                                                                 |                                                                                     | 34                                                                                  | 140                                                                                 | 0                                                                                   |
| Queue Length 95th (ft)  | 129                                                                               | 218                                                                               | 136                                                                               | 91                                                                                | 94                                                                                | 32                                                                                | m55                                                                                 | m161                                                                                |                                                                                     | 65                                                                                  | 188                                                                                 | 27                                                                                  |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 557                                                                               |                                                                                   |                                                                                   | 527                                                                               |                                                                                   |                                                                                     | 1222                                                                                |                                                                                     |                                                                                     | 436                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                                 |                                                                                     |                                                                                     | 215                                                                                 |                                                                                     | 215                                                                                 |
| Base Capacity (vph)     | 391                                                                               | 648                                                                               | 589                                                                               | 495                                                                               | 649                                                                               | 332                                                                               | 546                                                                                 | 1674                                                                                |                                                                                     | 217                                                                                 | 1369                                                                                | 656                                                                                 |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       | 0.41                                                                              | 0.77                                                                              | 0.71                                                                              | 0.52                                                                              | 0.32                                                                              | 0.15                                                                              | 0.50                                                                                | 0.74                                                                                |                                                                                     | 0.39                                                                                | 0.42                                                                                | 0.11                                                                                |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 64 (64%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 65

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.77

Intersection Signal Delay: 20.2

Intersection LOS: C

Intersection Capacity Utilization 72.7%

ICU Level of Service C

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: Century Ave & Centennial Rd

|                                                                                        |                                                                                        |                                                                                         |                                                                                          |
|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
|  ø2  |  ø1  |  ø3  |  ø4  |
| 44 s                                                                                   | 19 s                                                                                   | 13 s                                                                                    | 24 s                                                                                     |
|  ø5 |  ø6 |  ø7 |  ø8 |
| 12 s                                                                                   | 51 s                                                                                   | 13 s                                                                                    | 24 s                                                                                     |



**Appendix DD: 2059 - Signal at Trenton & NE/SW Loop Ramps AM  
(4D1)**

Exit 161 Operational Study  
Bismarck, ND

1: Divide Ave & Bismarck Expy

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |                                                                                   |  |  |  |  |  |  |  |  |  |
| Volume (vph)            | 161                                                                               | 173                                                                               | 25                                                                                | 267                                                                               | 182                                                                               | 623                                                                               | 34                                                                                  | 578                                                                                 | 97                                                                                  | 462                                                                                 | 1584                                                                                | 353                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 150                                                                               |                                                                                   | 0                                                                                 | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                 |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                   |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 100                                                                               |                                                                                   | 25                                                                                | 100                                                                               |                                                                                   | 100                                                                               | 100                                                                                 |                                                                                     | 150                                                                                 | 100                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 25                                                                                |                                                                                   |                                                                                   | 25                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 371                                                                               |                                                                                   |                                                                                   | 341                                                                               |                                                                                   |                                                                                     | 614                                                                                 |                                                                                     |                                                                                     | 458                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 10.1                                                                              |                                                                                   |                                                                                   | 9.3                                                                               |                                                                                   |                                                                                     | 10.5                                                                                |                                                                                     |                                                                                     | 7.8                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 4%                                                                                | 1%                                                                                | 1%                                                                                | 11%                                                                               | 10%                                                                               | 22%                                                                               | 10%                                                                                 | 7%                                                                                  | 17%                                                                                 | 11%                                                                                 | 4%                                                                                  | 4%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 175                                                                               | 215                                                                               | 0                                                                                 | 290                                                                               | 198                                                                               | 677                                                                               | 37                                                                                  | 628                                                                                 | 105                                                                                 | 502                                                                                 | 2106                                                                                | 0                                                                                   |
| Turn Type               | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                              |                                                                                   | pm+ov                                                                             | Perm                                                                                |                                                                                     | Perm                                                                                | pm+pt                                                                               |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 | 5                                                                                 |                                                                                     | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                   |                                                                                     | 6                                                                                   | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 | 4                                                                                 |                                                                                   | 8                                                                                 | 8                                                                                 | 5                                                                                 | 6                                                                                   | 6                                                                                   | 6                                                                                   | 5                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               | 6.0                                                                               |                                                                                   | 6.0                                                                               | 6.0                                                                               | 5.0                                                                               | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 5.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 30.0                                                                              | 30.0                                                                              |                                                                                   | 30.0                                                                              | 30.0                                                                              | 9.8                                                                               | 22.9                                                                                | 22.9                                                                                | 22.9                                                                                | 9.8                                                                                 | 28.7                                                                                |                                                                                     |
| Total Split (s)         | 34.0                                                                              | 34.0                                                                              | 0.0                                                                               | 34.0                                                                              | 34.0                                                                              | 35.4                                                                              | 30.6                                                                                | 30.6                                                                                | 30.6                                                                                | 35.4                                                                                | 66.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 34.0%                                                                             | 34.0%                                                                             | 0.0%                                                                              | 34.0%                                                                             | 34.0%                                                                             | 35.4%                                                                             | 30.6%                                                                               | 30.6%                                                                               | 30.6%                                                                               | 35.4%                                                                               | 66.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 3.0                                                                               | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 | 3.0                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 1.0                                                                               | 1.8                                                                                 | 1.8                                                                                 | 1.8                                                                                 | 1.0                                                                                 | 1.8                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 5.7                                                                                 | 5.7                                                                                 | 5.7                                                                                 | 4.0                                                                                 | 5.7                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lead                                                                              | Lag                                                                                 | Lag                                                                                 | Lag                                                                                 | Lag                                                                                 | Lead                                                                                |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                               | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 |                                                                                     |
| Recall Mode             | None                                                                              | None                                                                              |                                                                                   | None                                                                              | None                                                                              | None                                                                              | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               | None                                                                                | C-Min                                                                               |                                                                                     |
| Act Effect Green (s)    | 28.0                                                                              | 28.0                                                                              |                                                                                   | 28.0                                                                              | 28.0                                                                              | 61.3                                                                              | 29.0                                                                                | 29.0                                                                                | 29.0                                                                                | 62.0                                                                                | 60.3                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.28                                                                              | 0.28                                                                              |                                                                                   | 0.28                                                                              | 0.28                                                                              | 0.61                                                                              | 0.29                                                                                | 0.29                                                                                | 0.29                                                                                | 0.62                                                                                | 0.60                                                                                |                                                                                     |
| v/c Ratio               | 0.60                                                                              | 0.41                                                                              |                                                                                   | 1.12                                                                              | 0.41                                                                              | 0.82                                                                              | 0.54                                                                                | 0.64                                                                                | 0.22                                                                                | 0.86                                                                                | 1.02                                                                                |                                                                                     |
| Control Delay           | 41.3                                                                              | 31.2                                                                              |                                                                                   | 127.6                                                                             | 32.4                                                                              | 23.2                                                                              | 65.0                                                                                | 35.8                                                                                | 7.4                                                                                 | 28.5                                                                                | 37.9                                                                                |                                                                                     |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 36.7                                                                                |                                                                                     |
| Total Delay             | 41.3                                                                              | 31.2                                                                              |                                                                                   | 127.6                                                                             | 32.4                                                                              | 23.2                                                                              | 65.0                                                                                | 35.8                                                                                | 7.4                                                                                 | 28.5                                                                                | 74.6                                                                                |                                                                                     |
| LOS                     | D                                                                                 | C                                                                                 |                                                                                   | F                                                                                 | C                                                                                 | C                                                                                 | E                                                                                   | D                                                                                   | A                                                                                   | C                                                                                   | E                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 35.7                                                                              |                                                                                   |                                                                                   | 50.7                                                                              |                                                                                   |                                                                                     | 33.3                                                                                |                                                                                     |                                                                                     | 65.7                                                                                |                                                                                     |
| Approach LOS            |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | D                                                                                 |                                                                                   |                                                                                     | C                                                                                   |                                                                                     |                                                                                     | E                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 97                                                                                | 108                                                                               |                                                                                   | ~214                                                                              | 103                                                                               | 263                                                                               | 21                                                                                  | 193                                                                                 | 0                                                                                   | 205                                                                                 | ~605                                                                                |                                                                                     |
| Queue Length 95th (ft)  | 172                                                                               | 176                                                                               |                                                                                   | #377                                                                              | 168                                                                               | 435                                                                               | #77                                                                                 | 259                                                                                 | 41                                                                                  | m258                                                                                | #885                                                                                |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 291                                                                               |                                                                                   |                                                                                   | 261                                                                               |                                                                                   |                                                                                    | 534                                                                                 |                                                                                     |                                                                                     | 378                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 150                                                                               |                                                                                   |                                                                                   | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 291                                                                               | 522                                                                               |                                                                                   | 259                                                                               | 484                                                                               | 878                                                                               | 69                                                                                 | 978                                                                                 | 474                                                                                 | 634                                                                                 | 2055                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 167                                                                                 |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.60                                                                              | 0.41                                                                              |                                                                                   | 1.12                                                                              | 0.41                                                                              | 0.77                                                                              | 0.54                                                                               | 0.64                                                                                | 0.22                                                                                | 0.79                                                                                | 1.12                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 44 (44%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 110

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.12

Intersection Signal Delay: 54.7

Intersection LOS: D

Intersection Capacity Utilization 105.0%

ICU Level of Service G

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

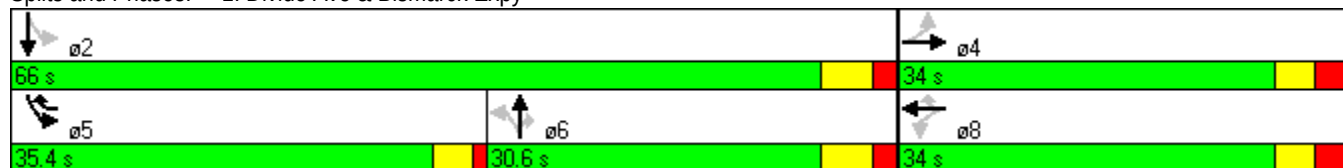
Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Divide Ave & Bismarck Expy



|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |                                                                                   |  |                                                                                   |                                                                                   |                                                                                   |                                                                                    |  |  |                                                                                     |  |  |
| Volume (vph)            | 188                                                                               | 0                                                                                 | 764                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 926                                                                                 | 135                                                                                 | 0                                                                                   | 1528                                                                                | 39                                                                                  |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                 | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 200                                                                               |                                                                                   | 200                                                                               | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     | 222                                                                                 |
| Storage Lanes           | 2                                                                                 |                                                                                   | 2                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  |                                                                                     | 1                                                                                   | 0                                                                                   |                                                                                     | 1                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 300                                                                               | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                 |                                                                                     | 25                                                                                  | 150                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                    |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                    | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 575                                                                               |                                                                                   |                                                                                   | 383                                                                               |                                                                                   |                                                                                    | 458                                                                                 |                                                                                     |                                                                                     | 769                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 13.1                                                                              |                                                                                   |                                                                                   | 8.7                                                                               |                                                                                   |                                                                                    | 7.8                                                                                 |                                                                                     |                                                                                     | 13.1                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                               | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                               | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 3%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                 | 8%                                                                                  | 27%                                                                                 | 10%                                                                                 | 9%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 204                                                                               | 0                                                                                 | 830                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 1007                                                                                | 147                                                                                 | 0                                                                                   | 1661                                                                                | 42                                                                                  |
| Turn Type               | custom                                                                            |                                                                                   | custom                                                                            |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     | Perm                                                                                |                                                                                     |                                                                                     | Free                                                                                |
| Protected Phases        |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     | 6                                                                                   |                                                                                     |                                                                                     | Free                                                                                |
| Detector Phase          | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                   | 6                                                                                   |                                                                                     | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               |                                                                                   | 6.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6.0                                                                                 | 6.0                                                                                 |                                                                                     | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 21.1                                                                              |                                                                                   | 21.1                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 23.4                                                                                | 23.4                                                                                |                                                                                     | 21.4                                                                                |                                                                                     |
| Total Split (s)         | 38.0                                                                              | 0.0                                                                               | 38.0                                                                              | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 62.0                                                                                | 62.0                                                                                | 0.0                                                                                 | 62.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 38.0%                                                                             | 0.0%                                                                              | 38.0%                                                                             | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                               | 62.0%                                                                               | 62.0%                                                                               | 0.0%                                                                                | 62.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.6                                                                               |                                                                                   | 3.6                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 3.9                                                                                 | 3.9                                                                                 |                                                                                     | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 1.5                                                                               |                                                                                   | 1.5                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 1.5                                                                                 | 1.5                                                                                 |                                                                                     | 1.5                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 5.1                                                                               | 4.0                                                                               | 5.1                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                                | 5.4                                                                                 | 5.4                                                                                 | 4.0                                                                                 | 5.4                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Recall Mode             | None                                                                              |                                                                                   | None                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | C-Min                                                                               | C-Min                                                                               |                                                                                     | C-Min                                                                               |                                                                                     |
| Act Effct Green (s)     | 31.6                                                                              |                                                                                   | 31.6                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 57.9                                                                                | 57.9                                                                                |                                                                                     | 57.9                                                                                | 100.0                                                                               |
| Actuated g/C Ratio      | 0.32                                                                              |                                                                                   | 0.32                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.58                                                                                | 0.58                                                                                |                                                                                     | 0.58                                                                                | 1.00                                                                                |
| v/c Ratio               | 0.19                                                                              |                                                                                   | 0.92                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.52                                                                                | 0.18                                                                                |                                                                                     | 0.87                                                                                | 0.03                                                                                |
| Control Delay           | 25.0                                                                              |                                                                                   | 47.5                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 13.3                                                                                | 3.1                                                                                 |                                                                                     | 14.8                                                                                | 0.0                                                                                 |
| Queue Delay             | 0.0                                                                               |                                                                                   | 4.2                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.2                                                                                 | 0.0                                                                                 |                                                                                     | 20.6                                                                                | 0.0                                                                                 |
| Total Delay             | 25.0                                                                              |                                                                                   | 51.7                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 13.5                                                                                | 3.1                                                                                 |                                                                                     | 35.4                                                                                | 0.0                                                                                 |
| LOS                     | C                                                                                 |                                                                                   | D                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | B                                                                                   | A                                                                                   |                                                                                     | D                                                                                   | A                                                                                   |
| Approach Delay          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 12.1                                                                                |                                                                                     |                                                                                     | 34.6                                                                                |                                                                                     |
| Approach LOS            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | B                                                                                   |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 47                                                                                |                                                                                   | 272                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 177                                                                                 | 9                                                                                   |                                                                                     | 373                                                                                 | 0                                                                                   |
| Queue Length 95th (ft)  | 74                                                                                |                                                                                   | #395                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 194                                                                                 | m15                                                                                 |                                                                                     | 503                                                                                 | m0                                                                                  |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 495                                                                               |                                                                                   |                                                                                   | 303                                                                               |                                                                                   |                                                                                    | 378                                                                                 |                                                                                     |                                                                                     | 689                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 200                                                                               |                                                                                   | 200                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     | 222                                                                                 |
| Base Capacity (vph)     | 1119                                                                              |                                                                                   | 940                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 1935                                                                                | 798                                                                                 |                                                                                     | 1917                                                                                | 1583                                                                                |
| Starvation Cap Reductn  | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 257                                                                                 | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   | 0                                                                                 |                                                                                   | 64                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   |                                                                                     | 311                                                                                 | 0                                                                                   |
| Storage Cap Reductn     | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       | 0.18                                                                              |                                                                                   | 0.95                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.60                                                                                | 0.18                                                                                |                                                                                     | 1.03                                                                                | 0.03                                                                                |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 20 (20%), Referenced to phase 2:SBT and 6:NBT, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.92

Intersection Signal Delay: 31.1

Intersection LOS: C

Intersection Capacity Utilization 77.7%

ICU Level of Service D

Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: South Ramp & Centennial Rd

|                                                                                     |                                                                                      |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
|  |  |
| ø2                                                                                  | ø4                                                                                   |
| 62 s                                                                                | 38 s                                                                                 |
|  |                                                                                      |
| ø6                                                                                  |                                                                                      |
| 62 s                                                                                |                                                                                      |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |                                                                                   |                                                                                   |                                                                                   |  |                                                                                   |  |                                                                                     |  |  |  |  |  |
| Volume (vph)            | 0                                                                                 | 0                                                                                 | 0                                                                                 | 193                                                                               | 0                                                                                 | 19                                                                                | 0                                                                                   | 573                                                                                 | 447                                                                                 | 0                                                                                   | 2128                                                                                | 475                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 16                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 150                                                                               | 0                                                                                   |                                                                                     | 215                                                                                 | 0                                                                                   |                                                                                     | 200                                                                                 |
| Storage Lanes           | 0                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                 |                                                                                   | 1                                                                                 | 0                                                                                   |                                                                                     | 1                                                                                   | 0                                                                                   |                                                                                     | 1                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 100                                                                               | 150                                                                                 |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 270                                                                               |                                                                                   |                                                                                   | 465                                                                               |                                                                                   |                                                                                     | 769                                                                                 |                                                                                     |                                                                                     | 782                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 6.1                                                                               |                                                                                   |                                                                                   | 10.6                                                                              |                                                                                   |                                                                                     | 13.1                                                                                |                                                                                     |                                                                                     | 13.3                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                | 2%                                                                                | 2%                                                                                | 12%                                                                               | 2%                                                                                | 8%                                                                                | 6%                                                                                  | 3%                                                                                  | 2%                                                                                  | 2%                                                                                  | 3%                                                                                  | 1%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 210                                                                               | 0                                                                                 | 21                                                                                | 0                                                                                   | 623                                                                                 | 486                                                                                 | 0                                                                                   | 2313                                                                                | 516                                                                                 |
| Turn Type               |                                                                                   |                                                                                   |                                                                                   | custom                                                                            |                                                                                   | custom                                                                            |                                                                                     |                                                                                     | Free                                                                                |                                                                                     |                                                                                     | Perm                                                                                |
| Protected Phases        |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        |                                                                                   |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 8                                                                                 |                                                                                     |                                                                                     | Free                                                                                |                                                                                     |                                                                                     | 2                                                                                   |
| Detector Phase          |                                                                                   |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 8                                                                                 |                                                                                     | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   | 2                                                                                   |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     |                                                                                   |                                                                                   |                                                                                   | 5.0                                                                               |                                                                                   | 5.0                                                                               |                                                                                     | 10.0                                                                                |                                                                                     |                                                                                     | 10.0                                                                                | 10.0                                                                                |
| Minimum Split (s)       |                                                                                   |                                                                                   |                                                                                   | 20.0                                                                              |                                                                                   | 20.0                                                                              |                                                                                     | 20.0                                                                                |                                                                                     |                                                                                     | 22.4                                                                                | 22.4                                                                                |
| Total Split (s)         | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 20.0                                                                              | 0.0                                                                               | 20.0                                                                              | 0.0                                                                                 | 80.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 80.0                                                                                | 80.0                                                                                |
| Total Split (%)         | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                              | 20.0%                                                                             | 0.0%                                                                              | 20.0%                                                                             | 0.0%                                                                                | 80.0%                                                                               | 0.0%                                                                                | 0.0%                                                                                | 80.0%                                                                               | 80.0%                                                                               |
| Yellow Time (s)         |                                                                                   |                                                                                   |                                                                                   | 3.2                                                                               |                                                                                   | 3.2                                                                               |                                                                                     | 3.9                                                                                 |                                                                                     |                                                                                     | 3.9                                                                                 | 3.9                                                                                 |
| All-Red Time (s)        |                                                                                   |                                                                                   |                                                                                   | 2.0                                                                               |                                                                                   | 2.0                                                                               |                                                                                     | 1.5                                                                                 |                                                                                     |                                                                                     | 1.5                                                                                 | 1.5                                                                                 |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 5.2                                                                               | 4.0                                                                               | 5.2                                                                               | 4.0                                                                                 | 5.4                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 5.4                                                                                 | 5.4                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Recall Mode             |                                                                                   |                                                                                   |                                                                                   | None                                                                              |                                                                                   | None                                                                              |                                                                                     | C-Min                                                                               |                                                                                     |                                                                                     | C-Min                                                                               | C-Min                                                                               |
| Act Effect Green (s)    |                                                                                   |                                                                                   |                                                                                   | 13.8                                                                              |                                                                                   | 13.8                                                                              |                                                                                     | 75.6                                                                                | 100.0                                                                               |                                                                                     | 75.6                                                                                | 75.6                                                                                |
| Actuated g/C Ratio      |                                                                                   |                                                                                   |                                                                                   | 0.14                                                                              |                                                                                   | 0.14                                                                              |                                                                                     | 0.76                                                                                | 1.00                                                                                |                                                                                     | 0.76                                                                                | 0.76                                                                                |
| v/c Ratio               |                                                                                   |                                                                                   |                                                                                   | 0.83                                                                              |                                                                                   | 0.09                                                                              |                                                                                     | 0.24                                                                                | 0.31                                                                                |                                                                                     | 0.87                                                                                | 0.39                                                                                |
| Control Delay           |                                                                                   |                                                                                   |                                                                                   | 69.3                                                                              |                                                                                   | 16.1                                                                              |                                                                                     | 5.4                                                                                 | 0.5                                                                                 |                                                                                     | 5.2                                                                                 | 0.6                                                                                 |
| Queue Delay             |                                                                                   |                                                                                   |                                                                                   | 0.0                                                                               |                                                                                   | 0.0                                                                               |                                                                                     | 0.0                                                                                 | 0.0                                                                                 |                                                                                     | 0.5                                                                                 | 0.0                                                                                 |
| Total Delay             |                                                                                   |                                                                                   |                                                                                   | 69.3                                                                              |                                                                                   | 16.1                                                                              |                                                                                     | 5.4                                                                                 | 0.5                                                                                 |                                                                                     | 5.7                                                                                 | 0.6                                                                                 |
| LOS                     |                                                                                   |                                                                                   |                                                                                   | E                                                                                 |                                                                                   | B                                                                                 |                                                                                     | A                                                                                   | A                                                                                   |                                                                                     | A                                                                                   | A                                                                                   |
| Approach Delay          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 3.2                                                                                 |                                                                                     |                                                                                     | 4.8                                                                                 |                                                                                     |
| Approach LOS            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     | A                                                                                   |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |
| Queue Length 50th (ft)  |                                                                                   |                                                                                   |                                                                                   | 130                                                                               |                                                                                   | 0                                                                                 |                                                                                     | 81                                                                                  | 0                                                                                   |                                                                                     | 177                                                                                 | 3                                                                                   |
| Queue Length 95th (ft)  |                                                                                   |                                                                                   |                                                                                   | #244                                                                              |                                                                                   | 22                                                                                |                                                                                     | 102                                                                                 | 0                                                                                   |                                                                                     | m161                                                                                | m0                                                                                  |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 190                                                                               |                                                                                   |                                                                                   | 385                                                                               |                                                                                   |                                                                                    | 689                                                                                 |                                                                                     |                                                                                     | 702                                                                                 |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 150                                                                               |                                                                                    |                                                                                     | 215                                                                                 |                                                                                     |                                                                                     | 200                                                                                 |
| Base Capacity (vph)     |                                                                                   |                                                                                   |                                                                                   | 270                                                                               |                                                                                   | 239                                                                               |                                                                                    | 2651                                                                                | 1583                                                                                |                                                                                     | 2651                                                                                | 1335                                                                                |
| Starvation Cap Reductn  |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                    | 0                                                                                   | 0                                                                                   |                                                                                     | 93                                                                                  | 0                                                                                   |
| Spillback Cap Reductn   |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                    | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                    | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       |                                                                                   |                                                                                   |                                                                                   | 0.78                                                                              |                                                                                   | 0.09                                                                              |                                                                                    | 0.24                                                                                | 0.31                                                                                |                                                                                     | 0.90                                                                                | 0.39                                                                                |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 89 (89%), Referenced to phase 2:SBT and 6:NBT, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.87

Intersection Signal Delay: 7.7

Intersection LOS: A

Intersection Capacity Utilization 77.3%

ICU Level of Service D

Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: North Ramp & Centennial Rd



|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |                                                                                   |  |  |  |  |                                                                                   |  |  |                                                                                     |  |  |                                                                                     |
| Volume (vph)            | 14                                                                                | 2                                                                                 | 423                                                                               | 177                                                                               | 9                                                                                 | 79                                                                                | 107                                                                                 | 595                                                                                 | 140                                                                                 | 22                                                                                  | 1755                                                                                | 29                                                                                  |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 0                                                                                 |                                                                                   | 200                                                                               | 200                                                                               |                                                                                   | 200                                                                               | 530                                                                                 |                                                                                     | 0                                                                                   | 215                                                                                 |                                                                                     | 150                                                                                 |
| Storage Lanes           | 0                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                   |                                                                                     | 0                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                  |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 632                                                                               |                                                                                   |                                                                                   | 937                                                                               |                                                                                   |                                                                                     | 782                                                                                 |                                                                                     |                                                                                     | 1308                                                                                |                                                                                     |
| Travel Time (s)         |                                                                                   | 14.4                                                                              |                                                                                   |                                                                                   | 21.3                                                                              |                                                                                   |                                                                                     | 13.3                                                                                |                                                                                     |                                                                                     | 22.3                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 0                                                                                 | 17                                                                                | 460                                                                               | 192                                                                               | 96                                                                                | 0                                                                                 | 116                                                                                 | 799                                                                                 | 0                                                                                   | 24                                                                                  | 1940                                                                                | 0                                                                                   |
| Turn Type               | Perm                                                                              |                                                                                   | Perm                                                                              | Perm                                                                              |                                                                                   |                                                                                   | pm+pt                                                                               |                                                                                     |                                                                                     | Perm                                                                                |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 | 8                                                                                 |                                                                                   |                                                                                   | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 | 4                                                                                 | 4                                                                                 | 8                                                                                 | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     | 2                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               |                                                                                   | 5.0                                                                                 | 4.0                                                                                 |                                                                                     | 4.0                                                                                 | 4.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              |                                                                                   | 9.0                                                                                 | 20.0                                                                                |                                                                                     | 20.0                                                                                | 20.0                                                                                |                                                                                     |
| Total Split (s)         | 29.0                                                                              | 29.0                                                                              | 29.0                                                                              | 29.0                                                                              | 29.0                                                                              | 0.0                                                                               | 12.0                                                                                | 71.0                                                                                | 0.0                                                                                 | 59.0                                                                                | 59.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 29.0%                                                                             | 29.0%                                                                             | 29.0%                                                                             | 29.0%                                                                             | 29.0%                                                                             | 0.0%                                                                              | 12.0%                                                                               | 71.0%                                                                               | 0.0%                                                                                | 59.0%                                                                               | 59.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               |                                                                                   | 3.5                                                                                 | 3.5                                                                                 |                                                                                     | 3.5                                                                                 | 3.5                                                                                 |                                                                                     |
| All-Red Time (s)        | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               |                                                                                   | 0.5                                                                                 | 0.5                                                                                 |                                                                                     | 0.5                                                                                 | 0.5                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lag                                                                                 |                                                                                     |                                                                                     | Lead                                                                                | Lead                                                                                |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 | Yes                                                                                 |                                                                                     |
| Recall Mode             | None                                                                              | None                                                                              | None                                                                              | None                                                                              | None                                                                              |                                                                                   | None                                                                                | C-Min                                                                               |                                                                                     | C-Min                                                                               | C-Min                                                                               |                                                                                     |
| Act Effect Green (s)    |                                                                                   | 23.9                                                                              | 23.9                                                                              | 23.9                                                                              | 23.9                                                                              |                                                                                   | 68.1                                                                                | 68.1                                                                                |                                                                                     | 57.2                                                                                | 57.2                                                                                |                                                                                     |
| Actuated g/C Ratio      |                                                                                   | 0.24                                                                              | 0.24                                                                              | 0.24                                                                              | 0.24                                                                              |                                                                                   | 0.68                                                                                | 0.68                                                                                |                                                                                     | 0.57                                                                                | 0.57                                                                                |                                                                                     |
| v/c Ratio               |                                                                                   | 0.05                                                                              | 0.94                                                                              | 0.58                                                                              | 0.21                                                                              |                                                                                   | 0.59                                                                                | 0.34                                                                                |                                                                                     | 0.07                                                                                | 0.96                                                                                |                                                                                     |
| Control Delay           |                                                                                   | 28.9                                                                              | 53.8                                                                              | 40.9                                                                              | 9.4                                                                               |                                                                                   | 34.0                                                                                | 4.6                                                                                 |                                                                                     | 4.6                                                                                 | 13.0                                                                                |                                                                                     |
| Queue Delay             |                                                                                   | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                                 | 0.0                                                                                 |                                                                                     | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |
| Total Delay             |                                                                                   | 28.9                                                                              | 53.8                                                                              | 40.9                                                                              | 9.4                                                                               |                                                                                   | 34.0                                                                                | 4.6                                                                                 |                                                                                     | 4.6                                                                                 | 13.0                                                                                |                                                                                     |
| LOS                     |                                                                                   | C                                                                                 | D                                                                                 | D                                                                                 | A                                                                                 |                                                                                   | C                                                                                   | A                                                                                   |                                                                                     | A                                                                                   | B                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 52.9                                                                              |                                                                                   |                                                                                   | 30.4                                                                              |                                                                                   |                                                                                     | 8.4                                                                                 |                                                                                     |                                                                                     | 12.9                                                                                |                                                                                     |
| Approach LOS            |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | C                                                                                 |                                                                                   |                                                                                     | A                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| Queue Length 50th (ft)  |                                                                                   | 8                                                                                 | 201                                                                               | 106                                                                               | 5                                                                                 |                                                                                   | 24                                                                                  | 38                                                                                  |                                                                                     | 4                                                                                   | 335                                                                                 |                                                                                     |
| Queue Length 95th (ft)  |                                                                                   | 26                                                                                | #396                                                                              | 180                                                                               | 45                                                                                |                                                                                   | 66                                                                                  | 68                                                                                  |                                                                                     | m3                                                                                  | m215                                                                                |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 552                                                                               |                                                                                   |                                                                                   | 857                                                                               |                                                                                   |                                                                                    | 702                                                                                 |                                                                                     |                                                                                     | 1228                                                                                |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   | 200                                                                               | 200                                                                               |                                                                                   |                                                                                   | 530                                                                                |                                                                                     |                                                                                     | 215                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     |                                                                                   | 387                                                                               | 509                                                                               | 350                                                                               | 471                                                                               |                                                                                   | 216                                                                                | 2365                                                                                |                                                                                     | 336                                                                                 | 2021                                                                                |                                                                                     |
| Starvation Cap Reductn  |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       |                                                                                   | 0.04                                                                              | 0.90                                                                              | 0.55                                                                              | 0.20                                                                              |                                                                                   | 0.54                                                                               | 0.34                                                                                |                                                                                     | 0.07                                                                                | 0.96                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 94 (94%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.96

Intersection Signal Delay: 18.4

Intersection LOS: B

Intersection Capacity Utilization 95.4%

ICU Level of Service F

Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Trenton Dr & Centennial Rd

|                                                                                        |                                                                                        |                                                                                          |
|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
|  ø2 |  ø1 |  ø4 |
| 59 s                                                                                   | 12 s                                                                                   | 29 s                                                                                     |
|  ø6 |                                                                                        |  ø8 |
| 71 s                                                                                   |                                                                                        | 29 s                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |  |  |  |  |  |  |                                                                                     |  |  |  |
| Volume (vph)            | 47                                                                                | 64                                                                                | 415                                                                               | 1147                                                                              | 475                                                                               | 62                                                                                | 182                                                                                 | 399                                                                                 | 38                                                                                  | 44                                                                                  | 1921                                                                                | 173                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                                 |                                                                                     | 0                                                                                   | 215                                                                                 |                                                                                     | 215                                                                                 |
| Storage Lanes           | 1                                                                                 |                                                                                   | 1                                                                                 | 2                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                   |                                                                                     | 0                                                                                   | 1                                                                                   |                                                                                     | 1                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                  |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 35                                                                                |                                                                                   |                                                                                   | 35                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 505                                                                               |                                                                                   |                                                                                   | 579                                                                               |                                                                                   |                                                                                     | 1308                                                                                |                                                                                     |                                                                                     | 512                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 9.8                                                                               |                                                                                   |                                                                                   | 11.3                                                                              |                                                                                   |                                                                                     | 22.3                                                                                |                                                                                     |                                                                                     | 8.7                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 51                                                                                | 70                                                                                | 451                                                                               | 1247                                                                              | 516                                                                               | 67                                                                                | 198                                                                                 | 475                                                                                 | 0                                                                                   | 48                                                                                  | 2088                                                                                | 188                                                                                 |
| Turn Type               | pm+pt                                                                             |                                                                                   | Perm                                                                              | pm+pt                                                                             |                                                                                   | Perm                                                                              | pm+pt                                                                               |                                                                                     |                                                                                     | pm+pt                                                                               |                                                                                     | Perm                                                                                |
| Protected Phases        | 7                                                                                 | 4                                                                                 |                                                                                   | 3                                                                                 | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     | 2                                                                                   |
| Detector Phase          | 7                                                                                 | 4                                                                                 | 4                                                                                 | 3                                                                                 | 8                                                                                 | 8                                                                                 | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   | 2                                                                                   |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 4.0                                                                               | 10.0                                                                              | 10.0                                                                              | 4.0                                                                               | 10.0                                                                              | 10.0                                                                              | 4.0                                                                                 | 6.0                                                                                 |                                                                                     | 4.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 |
| Minimum Split (s)       | 8.0                                                                               | 15.7                                                                              | 15.7                                                                              | 8.0                                                                               | 15.7                                                                              | 15.7                                                                              | 8.0                                                                                 | 11.5                                                                                |                                                                                     | 8.0                                                                                 | 11.5                                                                                | 11.5                                                                                |
| Total Split (s)         | 12.0                                                                              | 23.0                                                                              | 23.0                                                                              | 22.0                                                                              | 33.0                                                                              | 33.0                                                                              | 12.0                                                                                | 43.0                                                                                | 0.0                                                                                 | 12.0                                                                                | 43.0                                                                                | 43.0                                                                                |
| Total Split (%)         | 12.0%                                                                             | 23.0%                                                                             | 23.0%                                                                             | 22.0%                                                                             | 33.0%                                                                             | 33.0%                                                                             | 12.0%                                                                               | 43.0%                                                                               | 0.0%                                                                                | 12.0%                                                                               | 43.0%                                                                               | 43.0%                                                                               |
| Yellow Time (s)         | 3.5                                                                               | 3.9                                                                               | 3.9                                                                               | 3.5                                                                               | 3.9                                                                               | 3.9                                                                               | 3.5                                                                                 | 3.6                                                                                 |                                                                                     | 3.5                                                                                 | 3.6                                                                                 | 3.6                                                                                 |
| All-Red Time (s)        | 0.5                                                                               | 1.8                                                                               | 1.8                                                                               | 0.5                                                                               | 1.8                                                                               | 1.8                                                                               | 0.5                                                                                 | 1.9                                                                                 |                                                                                     | 0.5                                                                                 | 1.9                                                                                 | 1.9                                                                                 |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 5.7                                                                               | 5.7                                                                               | 4.0                                                                               | 5.7                                                                               | 5.7                                                                               | 4.0                                                                                 | 5.5                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 5.5                                                                                 | 5.5                                                                                 |
| Lead/Lag                | Lead                                                                              | Lag                                                                               | Lag                                                                               | Lead                                                                              | Lag                                                                               | Lag                                                                               | Lag                                                                                 | Lag                                                                                 |                                                                                     | Lead                                                                                | Lead                                                                                | Lead                                                                                |
| Lead-Lag Optimize?      | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                               |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Recall Mode             | None                                                                              | Max                                                                               | Max                                                                               | None                                                                              | Max                                                                               | Max                                                                               | None                                                                                | C-Max                                                                               |                                                                                     | None                                                                                | C-Max                                                                               | C-Max                                                                               |
| Act Effect Green (s)    | 26.0                                                                              | 17.3                                                                              | 17.3                                                                              | 41.0                                                                              | 30.2                                                                              | 30.2                                                                              | 44.0                                                                                | 42.5                                                                                |                                                                                     | 39.0                                                                                | 37.5                                                                                | 37.5                                                                                |
| Actuated g/C Ratio      | 0.26                                                                              | 0.17                                                                              | 0.17                                                                              | 0.41                                                                              | 0.30                                                                              | 0.30                                                                              | 0.44                                                                                | 0.42                                                                                |                                                                                     | 0.39                                                                                | 0.38                                                                                | 0.38                                                                                |
| v/c Ratio               | 0.18                                                                              | 0.11                                                                              | 1.17                                                                              | 1.13                                                                              | 0.48                                                                              | 0.13                                                                              | 0.88                                                                                | 0.32                                                                                |                                                                                     | 0.14                                                                                | 1.57                                                                                | 0.29                                                                                |
| Control Delay           | 20.7                                                                              | 35.5                                                                              | 130.3                                                                             | 98.9                                                                              | 31.3                                                                              | 7.8                                                                               | 63.8                                                                                | 14.1                                                                                |                                                                                     | 20.3                                                                                | 288.2                                                                               | 12.1                                                                                |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 |                                                                                     | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             | 20.7                                                                              | 35.5                                                                              | 130.3                                                                             | 98.9                                                                              | 31.3                                                                              | 7.8                                                                               | 63.8                                                                                | 14.1                                                                                |                                                                                     | 20.3                                                                                | 288.2                                                                               | 12.1                                                                                |
| LOS                     | C                                                                                 | D                                                                                 | F                                                                                 | F                                                                                 | C                                                                                 | A                                                                                 | E                                                                                   | B                                                                                   |                                                                                     | C                                                                                   | F                                                                                   | B                                                                                   |
| Approach Delay          |                                                                                   | 109.0                                                                             |                                                                                   |                                                                                   | 76.5                                                                              |                                                                                   |                                                                                     | 28.7                                                                                |                                                                                     |                                                                                     | 260.4                                                                               |                                                                                     |
| Approach LOS            |                                                                                   | F                                                                                 |                                                                                   |                                                                                   | E                                                                                 |                                                                                   |                                                                                     | C                                                                                   |                                                                                     |                                                                                     | F                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 19                                                                                | 20                                                                                | ~271                                                                              | ~445                                                                              | 145                                                                               | 0                                                                                 | 75                                                                                  | 80                                                                                  |                                                                                     | 19                                                                                  | ~1000                                                                               | 39                                                                                  |
| Queue Length 95th (ft)  | 43                                                                                | 40                                                                                | #467                                                                              | #608                                                                              | 200                                                                               | 32                                                                                | #231                                                                                | 100                                                                                 |                                                                                     | 42                                                                                  | #1138                                                                               | 89                                                                                  |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 425                                                                               |                                                                                   |                                                                                   | 499                                                                               |                                                                                   |                                                                                     | 1228                                                                                |                                                                                     |                                                                                     | 432                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                                 |                                                                                     |                                                                                     | 215                                                                                 |                                                                                     | 215                                                                                 |
| Base Capacity (vph)     | 305                                                                               | 612                                                                               | 384                                                                               | 1101                                                                              | 1068                                                                              | 525                                                                               | 226                                                                                 | 1490                                                                                |                                                                                     | 345                                                                                 | 1327                                                                                | 653                                                                                 |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       | 0.17                                                                              | 0.11                                                                              | 1.17                                                                              | 1.13                                                                              | 0.48                                                                              | 0.13                                                                              | 0.88                                                                                | 0.32                                                                                |                                                                                     | 0.14                                                                                | 1.57                                                                                | 0.29                                                                                |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 1 (1%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 150

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.57

Intersection Signal Delay: 153.1

Intersection LOS: F

Intersection Capacity Utilization 124.2%

ICU Level of Service H

Analysis Period (min) 15

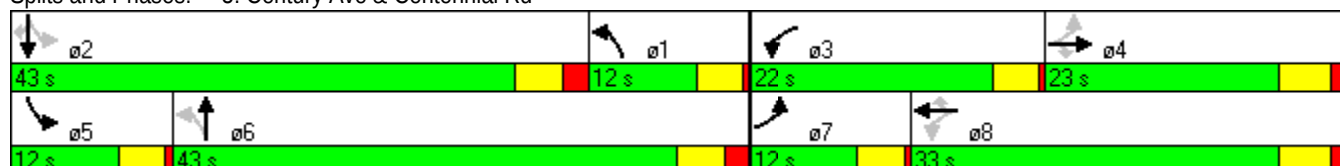
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 5: Century Ave & Centennial Rd





**Appendix EE: 2059 - Signal at Trenton & NE/SW Loop Ramps PM  
(4D2)**

Exit 161 Operational Study  
Bismarck, ND

1: Divide Ave & Bismarck Expy

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |                                                                                   |  |  |  |  |  |  |  |  |  |
| Volume (vph)            | 408                                                                               | 80                                                                                | 35                                                                                | 213                                                                               | 174                                                                               | 778                                                                               | 32                                                                                  | 1148                                                                                | 81                                                                                  | 291                                                                                 | 1240                                                                                | 188                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 150                                                                               |                                                                                   | 0                                                                                 | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                 |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                   |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 100                                                                               |                                                                                   | 25                                                                                | 100                                                                               |                                                                                   | 100                                                                               | 100                                                                                 |                                                                                     | 150                                                                                 | 100                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 25                                                                                |                                                                                   |                                                                                   | 25                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 371                                                                               |                                                                                   |                                                                                   | 341                                                                               |                                                                                   |                                                                                     | 614                                                                                 |                                                                                     |                                                                                     | 458                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 10.1                                                                              |                                                                                   |                                                                                   | 9.3                                                                               |                                                                                   |                                                                                     | 10.5                                                                                |                                                                                     |                                                                                     | 7.8                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 4%                                                                                | 1%                                                                                | 1%                                                                                | 11%                                                                               | 10%                                                                               | 22%                                                                               | 10%                                                                                 | 7%                                                                                  | 17%                                                                                 | 11%                                                                                 | 4%                                                                                  | 4%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 443                                                                               | 125                                                                               | 0                                                                                 | 232                                                                               | 189                                                                               | 846                                                                               | 35                                                                                  | 1248                                                                                | 88                                                                                  | 316                                                                                 | 1552                                                                                | 0                                                                                   |
| Turn Type               | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                              |                                                                                   | pm+ov                                                                             | Perm                                                                                |                                                                                     | Perm                                                                                | pm+pt                                                                               |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 | 5                                                                                 |                                                                                     | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                   |                                                                                     | 6                                                                                   | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 | 4                                                                                 |                                                                                   | 8                                                                                 | 8                                                                                 | 5                                                                                 | 6                                                                                   | 6                                                                                   | 6                                                                                   | 5                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               | 6.0                                                                               |                                                                                   | 6.0                                                                               | 6.0                                                                               | 5.0                                                                               | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 5.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 30.0                                                                              | 30.0                                                                              |                                                                                   | 30.0                                                                              | 30.0                                                                              | 9.8                                                                               | 22.9                                                                                | 22.9                                                                                | 22.9                                                                                | 9.8                                                                                 | 28.7                                                                                |                                                                                     |
| Total Split (s)         | 40.0                                                                              | 40.0                                                                              | 0.0                                                                               | 40.0                                                                              | 40.0                                                                              | 21.0                                                                              | 39.0                                                                                | 39.0                                                                                | 39.0                                                                                | 21.0                                                                                | 60.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 40.0%                                                                             | 40.0%                                                                             | 0.0%                                                                              | 40.0%                                                                             | 40.0%                                                                             | 21.0%                                                                             | 39.0%                                                                               | 39.0%                                                                               | 39.0%                                                                               | 21.0%                                                                               | 60.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 3.0                                                                               | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 | 3.0                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 1.0                                                                               | 1.8                                                                                 | 1.8                                                                                 | 1.8                                                                                 | 1.0                                                                                 | 1.8                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 5.7                                                                                 | 5.7                                                                                 | 5.7                                                                                 | 4.0                                                                                 | 5.7                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lead                                                                              | Lag                                                                                 | Lag                                                                                 | Lag                                                                                 | Lead                                                                                |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                               | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 |                                                                                     |                                                                                     |
| Recall Mode             | None                                                                              | None                                                                              |                                                                                   | None                                                                              | None                                                                              | None                                                                              | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               | None                                                                                | C-Min                                                                               |                                                                                     |
| Act Effect Green (s)    | 34.0                                                                              | 34.0                                                                              |                                                                                   | 34.0                                                                              | 34.0                                                                              | 57.0                                                                              | 33.3                                                                                | 33.3                                                                                | 33.3                                                                                | 56.0                                                                                | 54.3                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.34                                                                              | 0.34                                                                              |                                                                                   | 0.34                                                                              | 0.34                                                                              | 0.57                                                                              | 0.33                                                                                | 0.33                                                                                | 0.33                                                                                | 0.56                                                                                | 0.54                                                                                |                                                                                     |
| v/c Ratio               | 1.18                                                                              | 0.20                                                                              |                                                                                   | 0.59                                                                              | 0.32                                                                              | 1.12                                                                              | 0.51                                                                                | 1.11                                                                                | 0.17                                                                                | 0.91                                                                                | 0.83                                                                                |                                                                                     |
| Control Delay           | 136.5                                                                             | 19.8                                                                              |                                                                                   | 34.6                                                                              | 26.4                                                                              | 93.3                                                                              | 56.3                                                                                | 95.2                                                                                | 9.9                                                                                 | 50.3                                                                                | 17.4                                                                                |                                                                                     |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                               | 0.0                                                                               | 16.9                                                                              | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 1.2                                                                                 |                                                                                     |
| Total Delay             | 136.5                                                                             | 19.8                                                                              |                                                                                   | 34.6                                                                              | 26.4                                                                              | 110.1                                                                             | 56.3                                                                                | 95.2                                                                                | 9.9                                                                                 | 50.3                                                                                | 18.6                                                                                |                                                                                     |
| LOS                     | F                                                                                 | B                                                                                 |                                                                                   | C                                                                                 | C                                                                                 | F                                                                                 | E                                                                                   | F                                                                                   | A                                                                                   | D                                                                                   | B                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 110.8                                                                             |                                                                                   |                                                                                   | 83.8                                                                              |                                                                                   |                                                                                     | 88.7                                                                                |                                                                                     |                                                                                     | 23.9                                                                                |                                                                                     |
| Approach LOS            |                                                                                   | F                                                                                 |                                                                                   |                                                                                   | F                                                                                 |                                                                                   |                                                                                     | F                                                                                   |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | ~340                                                                              | 45                                                                                |                                                                                   | 121                                                                               | 89                                                                                | ~624                                                                              | 18                                                                                  | ~481                                                                                | 10                                                                                  | 128                                                                                 | 362                                                                                 |                                                                                     |
| Queue Length 95th (ft)  | #531                                                                              | 88                                                                                |                                                                                   | 204                                                                               | 147                                                                               | #861                                                                              | #66                                                                                 | #614                                                                                | 45                                                                                  | m#285                                                                               | 412                                                                                 |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 291                                                                               |                                                                                   |                                                                                   | 261                                                                               |                                                                                   |                                                                                    | 534                                                                                 |                                                                                     |                                                                                     | 378                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 150                                                                               |                                                                                   |                                                                                   | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 376                                                                               | 626                                                                               |                                                                                   | 394                                                                               | 587                                                                               | 757                                                                               | 69                                                                                 | 1124                                                                                | 503                                                                                 | 348                                                                                 | 1859                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 133                                                                                 |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 26                                                                                | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 1.18                                                                              | 0.20                                                                              |                                                                                   | 0.59                                                                              | 0.32                                                                              | 1.16                                                                              | 0.51                                                                               | 1.11                                                                                | 0.17                                                                                | 0.91                                                                                | 0.90                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 20 (20%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.18

Intersection Signal Delay: 66.1

Intersection LOS: E

Intersection Capacity Utilization 115.6%

ICU Level of Service H

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

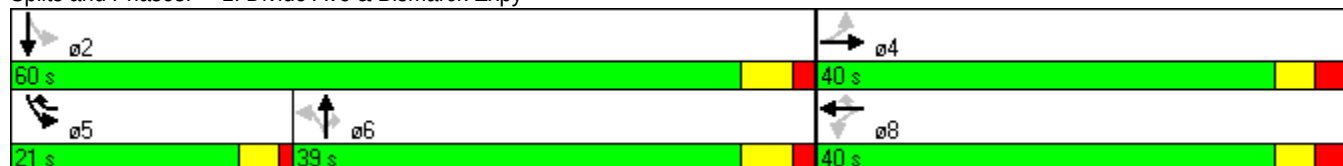
Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Divide Ave & Bismarck Expy



|                         |                                                                                    |  |                                                                                    |  |  |  |  |                                                                                      |  |  |                                                                                      |  |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                                                                                                                 | EBT                                                                               | EBR                                                                                                                                                                 | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                                                                                                     | NBR                                                                                 | SBL                                                                                 | SBT                                                                                                                                                                     | SBR                                                                                 |
| Lane Configurations     |   |                                                                                   |   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |   |  |                                                                                     |   |  |
| Volume (vph)            | 418                                                                                                                                                                 | 0                                                                                 | 561                                                                                                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 1862                                                                                                                                                                    | 182                                                                                 | 0                                                                                   | 939                                                                                                                                                                     | 46                                                                                  |
| Ideal Flow (vphpl)      | 1900                                                                                                                                                                | 1900                                                                              | 1900                                                                                                                                                                | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                                                                                                    | 1900                                                                                | 1900                                                                                | 1900                                                                                                                                                                    | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                                                                                                  | 12                                                                                | 12                                                                                                                                                                  | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                 | 12                                                                                                                                                                      | 12                                                                                  | 12                                                                                  | 12                                                                                                                                                                      | 12                                                                                  |
| Grade (%)               |                                                                                                                                                                     | 0%                                                                                |                                                                                                                                                                     |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                                                                                                      |                                                                                     |                                                                                     | 0%                                                                                                                                                                      |                                                                                     |
| Storage Length (ft)     | 200                                                                                                                                                                 |                                                                                   | 200                                                                                                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  |                                                                                                                                                                         | 0                                                                                   | 0                                                                                   |                                                                                                                                                                         | 222                                                                                 |
| Storage Lanes           | 2                                                                                                                                                                   |                                                                                   | 2                                                                                                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  |                                                                                                                                                                         | 1                                                                                   | 0                                                                                   |                                                                                                                                                                         | 1                                                                                   |
| Taper Length (ft)       | 25                                                                                                                                                                  |                                                                                   | 300                                                                                                                                                                 | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                 |                                                                                                                                                                         | 25                                                                                  | 150                                                                                 |                                                                                                                                                                         | 25                                                                                  |
| Right Turn on Red       |                                                                                                                                                                     |                                                                                   | Yes                                                                                                                                                                 |                                                                                   |                                                                                   | Yes                                                                               |                                                                                    |                                                                                                                                                                         | Yes                                                                                 |                                                                                     |                                                                                                                                                                         | Yes                                                                                 |
| Link Speed (mph)        |                                                                                                                                                                     | 30                                                                                |                                                                                                                                                                     |                                                                                   | 30                                                                                |                                                                                   |                                                                                    | 40                                                                                                                                                                      |                                                                                     |                                                                                     | 40                                                                                                                                                                      |                                                                                     |
| Link Distance (ft)      |                                                                                                                                                                     | 575                                                                               |                                                                                                                                                                     |                                                                                   | 383                                                                               |                                                                                   |                                                                                    | 458                                                                                                                                                                     |                                                                                     |                                                                                     | 769                                                                                                                                                                     |                                                                                     |
| Travel Time (s)         |                                                                                                                                                                     | 13.1                                                                              |                                                                                                                                                                     |                                                                                   | 8.7                                                                               |                                                                                   |                                                                                    | 7.8                                                                                                                                                                     |                                                                                     |                                                                                     | 13.1                                                                                                                                                                    |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                                                                                                     |                                                                                   |                                                                                                                                                                     |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                                                                                                         |                                                                                     |                                                                                     |                                                                                                                                                                         |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                                                                                                     |                                                                                   |                                                                                                                                                                     |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                                                                                                         |                                                                                     |                                                                                     |                                                                                                                                                                         |                                                                                     |
| Peak Hour Factor        | 0.92                                                                                                                                                                | 0.92                                                                              | 0.92                                                                                                                                                                | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                               | 0.92                                                                                                                                                                    | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                                                                                                    | 0.92                                                                                |
| Growth Factor           | 100%                                                                                                                                                                | 100%                                                                              | 100%                                                                                                                                                                | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                               | 100%                                                                                                                                                                    | 100%                                                                                | 100%                                                                                | 100%                                                                                                                                                                    | 100%                                                                                |
| Heavy Vehicles (%)      | 3%                                                                                                                                                                  | 2%                                                                                | 2%                                                                                                                                                                  | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                 | 8%                                                                                                                                                                      | 27%                                                                                 | 10%                                                                                 | 9%                                                                                                                                                                      | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                                                                                                   | 0                                                                                 | 0                                                                                                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                                                                                                       | 0                                                                                   | 0                                                                                   | 0                                                                                                                                                                       | 0                                                                                   |
| Parking (#/hr)          |                                                                                                                                                                     |                                                                                   |                                                                                                                                                                     |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                                                                                                         |                                                                                     |                                                                                     |                                                                                                                                                                         |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                                                                                                     | 0%                                                                                |                                                                                                                                                                     |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                                                                                                      |                                                                                     |                                                                                     | 0%                                                                                                                                                                      |                                                                                     |
| Shared Lane Traffic (%) |                                                                                                                                                                     |                                                                                   |                                                                                                                                                                     |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                                                                                                         |                                                                                     |                                                                                     |                                                                                                                                                                         |                                                                                     |
| Lane Group Flow (vph)   | 454                                                                                                                                                                 | 0                                                                                 | 610                                                                                                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 2024                                                                                                                                                                    | 198                                                                                 | 0                                                                                   | 1021                                                                                                                                                                    | 50                                                                                  |
| Turn Type               | custom                                                                                                                                                              |                                                                                   | custom                                                                                                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                                                                                                         | Perm                                                                                |                                                                                     |                                                                                                                                                                         | Free                                                                                |
| Protected Phases        |                                                                                                                                                                     |                                                                                   |                                                                                                                                                                     |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                                                                                                       |                                                                                     |                                                                                     | 2                                                                                                                                                                       |                                                                                     |
| Permitted Phases        | 4                                                                                                                                                                   |                                                                                   | 4                                                                                                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                                                                                                         | 6                                                                                   |                                                                                     |                                                                                                                                                                         | Free                                                                                |
| Detector Phase          | 4                                                                                                                                                                   |                                                                                   | 4                                                                                                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                                                                                                       | 6                                                                                   |                                                                                     | 2                                                                                                                                                                       |                                                                                     |
| Switch Phase            |                                                                                                                                                                     |                                                                                   |                                                                                                                                                                     |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                                                                                                         |                                                                                     |                                                                                     |                                                                                                                                                                         |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                                                                                                                 |                                                                                   | 6.0                                                                                                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6.0                                                                                                                                                                     | 6.0                                                                                 |                                                                                     | 6.0                                                                                                                                                                     |                                                                                     |
| Minimum Split (s)       | 21.1                                                                                                                                                                |                                                                                   | 21.1                                                                                                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 23.4                                                                                                                                                                    | 23.4                                                                                |                                                                                     | 21.4                                                                                                                                                                    |                                                                                     |
| Total Split (s)         | 24.0                                                                                                                                                                | 0.0                                                                               | 24.0                                                                                                                                                                | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 76.0                                                                                                                                                                    | 76.0                                                                                | 0.0                                                                                 | 76.0                                                                                                                                                                    | 0.0                                                                                 |
| Total Split (%)         | 24.0%                                                                                                                                                               | 0.0%                                                                              | 24.0%                                                                                                                                                               | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                               | 76.0%                                                                                                                                                                   | 76.0%                                                                               | 0.0%                                                                                | 76.0%                                                                                                                                                                   | 0.0%                                                                                |
| Yellow Time (s)         | 3.6                                                                                                                                                                 |                                                                                   | 3.6                                                                                                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 3.9                                                                                                                                                                     | 3.9                                                                                 |                                                                                     | 3.9                                                                                                                                                                     |                                                                                     |
| All-Red Time (s)        | 1.5                                                                                                                                                                 |                                                                                   | 1.5                                                                                                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 1.5                                                                                                                                                                     | 1.5                                                                                 |                                                                                     | 1.5                                                                                                                                                                     |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                                                                                                                 | 0.0                                                                               | 0.0                                                                                                                                                                 | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                                                                                                     | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                                                                                                     | 0.0                                                                                 |
| Total Lost Time (s)     | 5.1                                                                                                                                                                 | 4.0                                                                               | 5.1                                                                                                                                                                 | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                                | 5.4                                                                                                                                                                     | 5.4                                                                                 | 4.0                                                                                 | 5.4                                                                                                                                                                     | 4.0                                                                                 |
| Lead/Lag                |                                                                                                                                                                     |                                                                                   |                                                                                                                                                                     |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                                                                                                         |                                                                                     |                                                                                     |                                                                                                                                                                         |                                                                                     |
| Lead-Lag Optimize?      |                                                                                                                                                                     |                                                                                   |                                                                                                                                                                     |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                                                                                                         |                                                                                     |                                                                                     |                                                                                                                                                                         |                                                                                     |
| Recall Mode             | None                                                                                                                                                                |                                                                                   | None                                                                                                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    | C-Min                                                                                                                                                                   | C-Min                                                                               |                                                                                     | C-Min                                                                                                                                                                   |                                                                                     |
| Act Effct Green (s)     | 17.8                                                                                                                                                                |                                                                                   | 17.8                                                                                                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 71.7                                                                                                                                                                    | 71.7                                                                                |                                                                                     | 71.7                                                                                                                                                                    | 100.0                                                                               |
| Actuated g/C Ratio      | 0.18                                                                                                                                                                |                                                                                   | 0.18                                                                                                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.72                                                                                                                                                                    | 0.72                                                                                |                                                                                     | 0.72                                                                                                                                                                    | 1.00                                                                                |
| v/c Ratio               | 0.75                                                                                                                                                                |                                                                                   | 0.83                                                                                                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.84                                                                                                                                                                    | 0.20                                                                                |                                                                                     | 0.43                                                                                                                                                                    | 0.03                                                                                |
| Control Delay           | 47.4                                                                                                                                                                |                                                                                   | 31.7                                                                                                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 8.6                                                                                                                                                                     | 0.8                                                                                 |                                                                                     | 7.6                                                                                                                                                                     | 0.0                                                                                 |
| Queue Delay             | 0.0                                                                                                                                                                 |                                                                                   | 0.7                                                                                                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 12.2                                                                                                                                                                    | 0.0                                                                                 |                                                                                     | 0.1                                                                                                                                                                     | 0.0                                                                                 |
| Total Delay             | 47.4                                                                                                                                                                |                                                                                   | 32.4                                                                                                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 20.8                                                                                                                                                                    | 0.8                                                                                 |                                                                                     | 7.6                                                                                                                                                                     | 0.0                                                                                 |
| LOS                     | D                                                                                                                                                                   |                                                                                   | C                                                                                                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | C                                                                                                                                                                       | A                                                                                   |                                                                                     | A                                                                                                                                                                       | A                                                                                   |
| Approach Delay          |                                                                                                                                                                     |                                                                                   |                                                                                                                                                                     |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 19.0                                                                                                                                                                    |                                                                                     |                                                                                     | 7.3                                                                                                                                                                     |                                                                                     |
| Approach LOS            |                                                                                                                                                                     |                                                                                   |                                                                                                                                                                     |                                                                                   |                                                                                   |                                                                                   |                                                                                    | B                                                                                                                                                                       |                                                                                     |                                                                                     | A                                                                                                                                                                       |                                                                                     |
| Queue Length 50th (ft)  | 140                                                                                                                                                                 |                                                                                   | 113                                                                                                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 327                                                                                                                                                                     | 3                                                                                   |                                                                                     | 110                                                                                                                                                                     | 0                                                                                   |
| Queue Length 95th (ft)  | 195                                                                                                                                                                 |                                                                                   | #193                                                                                                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    | m275                                                                                                                                                                    | m0                                                                                  |                                                                                     | 122                                                                                                                                                                     | m0                                                                                  |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 495                                                                               |                                                                                   |                                                                                   | 303                                                                               |                                                                                   |                                                                                    | 378                                                                                 |                                                                                     |                                                                                     | 689                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 200                                                                               |                                                                                   | 200                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     | 222                                                                                 |
| Base Capacity (vph)     | 643                                                                               |                                                                                   | 760                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 2398                                                                                | 968                                                                                 |                                                                                     | 2376                                                                                | 1583                                                                                |
| Starvation Cap Reductn  | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 393                                                                                 | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   | 0                                                                                 |                                                                                   | 26                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   |                                                                                     | 301                                                                                 | 0                                                                                   |
| Storage Cap Reductn     | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       | 0.71                                                                              |                                                                                   | 0.83                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 1.01                                                                                | 0.20                                                                                |                                                                                     | 0.49                                                                                | 0.03                                                                                |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 92 (92%), Referenced to phase 2:SBT and 6:NBT, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.84

Intersection Signal Delay: 21.0

Intersection LOS: C

Intersection Capacity Utilization 71.2%

ICU Level of Service C

Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: South Ramp & Centennial Rd



|                         |  |      |      |                                                                                   |      |                                                                                   |      |                                                                                     |                                                                                     |      |                                                                                     |                                                                                     |
|-------------------------|------------------------------------------------------------------------------------|------|------|-----------------------------------------------------------------------------------|------|-----------------------------------------------------------------------------------|------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                                | EBT  | EBR  | WBL                                                                               | WBT  | WBR                                                                               | NBL  | NBT                                                                                 | NBR                                                                                 | SBL  | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |                                                                                    |      |      |  |      |  |      |  |  |      |  |  |
| Volume (vph)            | 0                                                                                  | 0    | 0    | 210                                                                               | 0    | 45                                                                                | 0    | 1424                                                                                | 501                                                                                 | 0    | 838                                                                                 | 233                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                               | 1900 | 1900 | 1900                                                                              | 1900 | 1900                                                                              | 1900 | 1900                                                                                | 1900                                                                                | 1900 | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                 | 12   | 12   | 16                                                                                | 12   | 12                                                                                | 12   | 12                                                                                  | 12                                                                                  | 12   | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                    | 0%   |      |                                                                                   | 0%   |                                                                                   |      | 0%                                                                                  |                                                                                     |      | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 0                                                                                  |      | 0    | 0                                                                                 |      | 150                                                                               | 0    |                                                                                     | 215                                                                                 | 0    |                                                                                     | 200                                                                                 |
| Storage Lanes           | 0                                                                                  |      | 0    | 1                                                                                 |      | 1                                                                                 | 0    |                                                                                     | 1                                                                                   | 0    |                                                                                     | 1                                                                                   |
| Taper Length (ft)       | 25                                                                                 |      | 25   | 25                                                                                |      | 100                                                                               | 150  |                                                                                     | 25                                                                                  | 25   |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                    |      | Yes  |                                                                                   |      | Yes                                                                               |      |                                                                                     | Yes                                                                                 |      |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                    | 30   |      |                                                                                   | 30   |                                                                                   |      | 40                                                                                  |                                                                                     |      | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                    | 270  |      |                                                                                   | 465  |                                                                                   |      | 769                                                                                 |                                                                                     |      | 788                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                    | 6.1  |      |                                                                                   | 10.6 |                                                                                   |      | 13.1                                                                                |                                                                                     |      | 13.4                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                    |      |      |                                                                                   |      |                                                                                   |      |                                                                                     |                                                                                     |      |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                    |      |      |                                                                                   |      |                                                                                   |      |                                                                                     |                                                                                     |      |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                               | 0.92 | 0.92 | 0.92                                                                              | 0.92 | 0.92                                                                              | 0.92 | 0.92                                                                                | 0.92                                                                                | 0.92 | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                               | 100% | 100% | 100%                                                                              | 100% | 100%                                                                              | 100% | 100%                                                                                | 100%                                                                                | 100% | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                 | 2%   | 2%   | 12%                                                                               | 2%   | 8%                                                                                | 6%   | 3%                                                                                  | 2%                                                                                  | 2%   | 3%                                                                                  | 1%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                  | 0    | 0    | 0                                                                                 | 0    | 0                                                                                 | 0    | 0                                                                                   | 0                                                                                   | 0    | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                    |      |      |                                                                                   |      |                                                                                   |      |                                                                                     |                                                                                     |      |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                    | 0%   |      |                                                                                   | 0%   |                                                                                   |      | 0%                                                                                  |                                                                                     |      | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                    |      |      |                                                                                   |      |                                                                                   |      |                                                                                     |                                                                                     |      |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 0                                                                                  | 0    | 0    | 228                                                                               | 0    | 49                                                                                | 0    | 1548                                                                                | 545                                                                                 | 0    | 911                                                                                 | 253                                                                                 |
| Turn Type               |                                                                                    |      |      | custom                                                                            |      | custom                                                                            |      |                                                                                     | Free                                                                                |      |                                                                                     | Perm                                                                                |
| Protected Phases        |                                                                                    |      |      |                                                                                   |      |                                                                                   |      | 6                                                                                   |                                                                                     |      | 2                                                                                   |                                                                                     |
| Permitted Phases        |                                                                                    |      |      | 8                                                                                 |      | 8                                                                                 |      |                                                                                     | Free                                                                                |      |                                                                                     | 2                                                                                   |
| Detector Phase          |                                                                                    |      |      | 8                                                                                 |      | 8                                                                                 |      | 6                                                                                   |                                                                                     |      | 2                                                                                   | 2                                                                                   |
| Switch Phase            |                                                                                    |      |      |                                                                                   |      |                                                                                   |      |                                                                                     |                                                                                     |      |                                                                                     |                                                                                     |
| Minimum Initial (s)     |                                                                                    |      |      | 5.0                                                                               |      | 5.0                                                                               |      | 10.0                                                                                |                                                                                     |      | 10.0                                                                                | 10.0                                                                                |
| Minimum Split (s)       |                                                                                    |      |      | 20.0                                                                              |      | 20.0                                                                              |      | 20.0                                                                                |                                                                                     |      | 22.4                                                                                | 22.4                                                                                |
| Total Split (s)         | 0.0                                                                                | 0.0  | 0.0  | 29.0                                                                              | 0.0  | 29.0                                                                              | 0.0  | 71.0                                                                                | 0.0                                                                                 | 0.0  | 71.0                                                                                | 71.0                                                                                |
| Total Split (%)         | 0.0%                                                                               | 0.0% | 0.0% | 29.0%                                                                             | 0.0% | 29.0%                                                                             | 0.0% | 71.0%                                                                               | 0.0%                                                                                | 0.0% | 71.0%                                                                               | 71.0%                                                                               |
| Yellow Time (s)         |                                                                                    |      |      | 3.2                                                                               |      | 3.2                                                                               |      | 3.9                                                                                 |                                                                                     |      | 3.9                                                                                 | 3.9                                                                                 |
| All-Red Time (s)        |                                                                                    |      |      | 2.0                                                                               |      | 2.0                                                                               |      | 1.5                                                                                 |                                                                                     |      | 1.5                                                                                 | 1.5                                                                                 |
| Lost Time Adjust (s)    | 0.0                                                                                | 0.0  | 0.0  | 0.0                                                                               | 0.0  | 0.0                                                                               | 0.0  | 0.0                                                                                 | 0.0                                                                                 | 0.0  | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                                | 4.0  | 4.0  | 5.2                                                                               | 4.0  | 5.2                                                                               | 4.0  | 5.4                                                                                 | 4.0                                                                                 | 4.0  | 5.4                                                                                 | 5.4                                                                                 |
| Lead/Lag                |                                                                                    |      |      |                                                                                   |      |                                                                                   |      |                                                                                     |                                                                                     |      |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                    |      |      |                                                                                   |      |                                                                                   |      |                                                                                     |                                                                                     |      |                                                                                     |                                                                                     |
| Recall Mode             |                                                                                    |      |      | None                                                                              |      | None                                                                              |      | C-Min                                                                               |                                                                                     |      | C-Min                                                                               | C-Min                                                                               |
| Act Effect Green (s)    |                                                                                    |      |      | 16.8                                                                              |      | 16.8                                                                              |      | 72.6                                                                                | 100.0                                                                               |      | 72.6                                                                                | 72.6                                                                                |
| Actuated g/C Ratio      |                                                                                    |      |      | 0.17                                                                              |      | 0.17                                                                              |      | 0.73                                                                                | 1.00                                                                                |      | 0.73                                                                                | 0.73                                                                                |
| v/c Ratio               |                                                                                    |      |      | 0.75                                                                              |      | 0.17                                                                              |      | 0.61                                                                                | 0.34                                                                                |      | 0.36                                                                                | 0.21                                                                                |
| Control Delay           |                                                                                    |      |      | 53.9                                                                              |      | 12.0                                                                              |      | 6.1                                                                                 | 0.3                                                                                 |      | 6.4                                                                                 | 2.2                                                                                 |
| Queue Delay             |                                                                                    |      |      | 0.0                                                                               |      | 0.0                                                                               |      | 0.2                                                                                 | 0.0                                                                                 |      | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             |                                                                                    |      |      | 53.9                                                                              |      | 12.0                                                                              |      | 6.3                                                                                 | 0.3                                                                                 |      | 6.4                                                                                 | 2.2                                                                                 |
| LOS                     |                                                                                    |      |      | D                                                                                 |      | B                                                                                 |      | A                                                                                   | A                                                                                   |      | A                                                                                   | A                                                                                   |
| Approach Delay          |                                                                                    |      |      |                                                                                   |      |                                                                                   |      | 4.7                                                                                 |                                                                                     |      | 5.5                                                                                 |                                                                                     |
| Approach LOS            |                                                                                    |      |      |                                                                                   |      |                                                                                   |      | A                                                                                   |                                                                                     |      | A                                                                                   |                                                                                     |
| Queue Length 50th (ft)  |                                                                                    |      |      | 140                                                                               |      | 2                                                                                 |      | 142                                                                                 | 0                                                                                   |      | 121                                                                                 | 16                                                                                  |
| Queue Length 95th (ft)  |                                                                                    |      |      | 205                                                                               |      | 31                                                                                |      | 276                                                                                 | m0                                                                                  |      | m145                                                                                | m31                                                                                 |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 190                                                                               |                                                                                   |                                                                                   | 385                                                                               |                                                                                   |                                                                                    | 689                                                                                 |                                                                                     |                                                                                     | 708                                                                                 |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 150                                                                               |                                                                                    |                                                                                     | 215                                                                                 |                                                                                     |                                                                                     | 200                                                                                 |
| Base Capacity (vph)     |                                                                                   |                                                                                   |                                                                                   | 435                                                                               |                                                                                   | 391                                                                               |                                                                                    | 2545                                                                                | 1583                                                                                |                                                                                     | 2545                                                                                | 1230                                                                                |
| Starvation Cap Reductn  |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                    | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 4                                                                                 |                                                                                    | 318                                                                                 | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                    | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       |                                                                                   |                                                                                   |                                                                                   | 0.52                                                                              |                                                                                   | 0.13                                                                              |                                                                                    | 0.70                                                                                | 0.34                                                                                |                                                                                     | 0.36                                                                                | 0.21                                                                                |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 12 (12%), Referenced to phase 2:SBT and 6:NBT, Start of Green

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.75

Intersection Signal Delay: 8.3

Intersection LOS: A

Intersection Capacity Utilization 58.8%

ICU Level of Service B

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: North Ramp & Centennial Rd



|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |                                                                                   |  |  |  |  |                                                                                   |  |  |                                                                                     |  |  |                                                                                     |
| Volume (vph)            | 28                                                                                | 5                                                                                 | 170                                                                               | 236                                                                               | 2                                                                                 | 149                                                                               | 194                                                                                 | 2017                                                                                | 365                                                                                 | 51                                                                                  | 800                                                                                 | 22                                                                                  |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 0                                                                                 |                                                                                   | 200                                                                               | 200                                                                               |                                                                                   | 200                                                                               | 530                                                                                 |                                                                                     | 0                                                                                   | 215                                                                                 |                                                                                     | 150                                                                                 |
| Storage Lanes           | 0                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                   |                                                                                     | 0                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                  |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 604                                                                               |                                                                                   |                                                                                   | 932                                                                               |                                                                                   |                                                                                     | 788                                                                                 |                                                                                     |                                                                                     | 1302                                                                                |                                                                                     |
| Travel Time (s)         |                                                                                   | 13.7                                                                              |                                                                                   |                                                                                   | 21.2                                                                              |                                                                                   |                                                                                     | 13.4                                                                                |                                                                                     |                                                                                     | 22.2                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 0                                                                                 | 35                                                                                | 185                                                                               | 257                                                                               | 164                                                                               | 0                                                                                 | 211                                                                                 | 2589                                                                                | 0                                                                                   | 55                                                                                  | 894                                                                                 | 0                                                                                   |
| Turn Type               | Perm                                                                              |                                                                                   | Perm                                                                              | Perm                                                                              |                                                                                   |                                                                                   | pm+pt                                                                               |                                                                                     |                                                                                     | pm+pt                                                                               |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 | 8                                                                                 |                                                                                   |                                                                                   | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 | 4                                                                                 | 4                                                                                 | 8                                                                                 | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               |                                                                                   | 5.0                                                                                 | 4.0                                                                                 |                                                                                     | 5.0                                                                                 | 4.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              |                                                                                   | 9.0                                                                                 | 20.0                                                                                |                                                                                     | 9.0                                                                                 | 20.0                                                                                |                                                                                     |
| Total Split (s)         | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 0.0                                                                               | 16.0                                                                                | 68.0                                                                                | 0.0                                                                                 | 12.0                                                                                | 64.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 20.0%                                                                             | 20.0%                                                                             | 20.0%                                                                             | 20.0%                                                                             | 20.0%                                                                             | 0.0%                                                                              | 16.0%                                                                               | 68.0%                                                                               | 0.0%                                                                                | 12.0%                                                                               | 64.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               |                                                                                   | 3.5                                                                                 | 3.5                                                                                 |                                                                                     | 3.5                                                                                 | 3.5                                                                                 |                                                                                     |
| All-Red Time (s)        | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               |                                                                                   | 0.5                                                                                 | 0.5                                                                                 |                                                                                     | 0.5                                                                                 | 0.5                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lead                                                                                | Lead                                                                                |                                                                                     | Lag                                                                                 | Lag                                                                                 |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                                 | Yes                                                                                 |                                                                                     | Yes                                                                                 | Yes                                                                                 |                                                                                     |
| Recall Mode             | None                                                                              | None                                                                              | None                                                                              | None                                                                              | None                                                                              |                                                                                   | None                                                                                | C-Min                                                                               |                                                                                     | None                                                                                | C-Min                                                                               |                                                                                     |
| Act Effct Green (s)     |                                                                                   | 19.1                                                                              | 19.1                                                                              | 19.1                                                                              | 19.1                                                                              |                                                                                   | 64.0                                                                                | 64.0                                                                                |                                                                                     | 59.8                                                                                | 58.7                                                                                |                                                                                     |
| Actuated g/C Ratio      |                                                                                   | 0.19                                                                              | 0.19                                                                              | 0.19                                                                              | 0.19                                                                              |                                                                                   | 0.64                                                                                | 0.64                                                                                |                                                                                     | 0.60                                                                                | 0.59                                                                                |                                                                                     |
| v/c Ratio               |                                                                                   | 0.13                                                                              | 0.41                                                                              | 0.98                                                                              | 0.40                                                                              |                                                                                   | 0.51                                                                                | 1.16                                                                                |                                                                                     | 0.28                                                                                | 0.43                                                                                |                                                                                     |
| Control Delay           |                                                                                   | 37.4                                                                              | 8.7                                                                               | 94.9                                                                              | 12.9                                                                              |                                                                                   | 8.5                                                                                 | 95.0                                                                                |                                                                                     | 13.6                                                                                | 6.5                                                                                 |                                                                                     |
| Queue Delay             |                                                                                   | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                                 | 0.0                                                                                 |                                                                                     | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |
| Total Delay             |                                                                                   | 37.4                                                                              | 8.7                                                                               | 94.9                                                                              | 12.9                                                                              |                                                                                   | 8.5                                                                                 | 95.0                                                                                |                                                                                     | 13.6                                                                                | 6.5                                                                                 |                                                                                     |
| LOS                     |                                                                                   | D                                                                                 | A                                                                                 | F                                                                                 | B                                                                                 |                                                                                   | A                                                                                   | F                                                                                   |                                                                                     | B                                                                                   | A                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 13.3                                                                              |                                                                                   |                                                                                   | 63.0                                                                              |                                                                                   |                                                                                     | 88.5                                                                                |                                                                                     |                                                                                     | 6.9                                                                                 |                                                                                     |
| Approach LOS            |                                                                                   | B                                                                                 |                                                                                   |                                                                                   | E                                                                                 |                                                                                   |                                                                                     | F                                                                                   |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |
| Queue Length 50th (ft)  |                                                                                   | 19                                                                                | 0                                                                                 | ~184                                                                              | 15                                                                                |                                                                                   | 23                                                                                  | ~1030                                                                               |                                                                                     | 7                                                                                   | 58                                                                                  |                                                                                     |
| Queue Length 95th (ft)  |                                                                                   | 48                                                                                | 59                                                                                | #353                                                                              | 74                                                                                |                                                                                   | 37                                                                                  | #1170                                                                               |                                                                                     | m13                                                                                 | 59                                                                                  |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 524                                                                               |                                                                                   |                                                                                   | 852                                                                               |                                                                                   |                                                                                    | 708                                                                                 |                                                                                     |                                                                                     | 1222                                                                                |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   | 200                                                                               | 200                                                                               |                                                                                   |                                                                                   | 530                                                                                |                                                                                     |                                                                                     | 215                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     |                                                                                   | 263                                                                               | 453                                                                               | 262                                                                               | 414                                                                               |                                                                                   | 436                                                                                | 2228                                                                                |                                                                                     | 216                                                                                 | 2126                                                                                |                                                                                     |
| Starvation Cap Reductn  |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       |                                                                                   | 0.13                                                                              | 0.41                                                                              | 0.98                                                                              | 0.40                                                                              |                                                                                   | 0.48                                                                               | 1.16                                                                                |                                                                                     | 0.25                                                                                | 0.42                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 39 (39%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 150

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.16

Intersection Signal Delay: 64.6

Intersection LOS: E

Intersection Capacity Utilization 101.3%

ICU Level of Service G

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Trenton Dr & Centennial Rd



|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |  |  |  |  |  |  |  |  |  |  |
| Volume (vph)            | 149                                                                               | 459                                                                               | 387                                                                               | 235                                                                               | 189                                                                               | 46                                                                                | 252                                                                                | 798                                                                                 | 343                                                                                 | 78                                                                                  | 534                                                                                 | 66                                                                                  |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                 | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                                |                                                                                     | 0                                                                                   | 215                                                                                 |                                                                                     | 215                                                                                 |
| Storage Lanes           | 1                                                                                 |                                                                                   | 1                                                                                 | 2                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                  |                                                                                     | 0                                                                                   | 1                                                                                   |                                                                                     | 1                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                 |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                    |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 35                                                                                |                                                                                   |                                                                                   | 35                                                                                |                                                                                   |                                                                                    | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 637                                                                               |                                                                                   |                                                                                   | 607                                                                               |                                                                                   |                                                                                    | 1302                                                                                |                                                                                     |                                                                                     | 516                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 12.4                                                                              |                                                                                   |                                                                                   | 11.8                                                                              |                                                                                   |                                                                                    | 22.2                                                                                |                                                                                     |                                                                                     | 8.8                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                               | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                               | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                 | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 162                                                                               | 499                                                                               | 421                                                                               | 255                                                                               | 205                                                                               | 50                                                                                | 274                                                                                | 1240                                                                                | 0                                                                                   | 85                                                                                  | 580                                                                                 | 72                                                                                  |
| Turn Type               | pm+pt                                                                             |                                                                                   | Perm                                                                              | pm+pt                                                                             |                                                                                   | Perm                                                                              | pm+pt                                                                              |                                                                                     |                                                                                     | pm+pt                                                                               |                                                                                     | Perm                                                                                |
| Protected Phases        | 7                                                                                 | 4                                                                                 |                                                                                   | 3                                                                                 | 8                                                                                 |                                                                                   | 1                                                                                  | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                  |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     | 2                                                                                   |
| Detector Phase          | 7                                                                                 | 4                                                                                 | 4                                                                                 | 3                                                                                 | 8                                                                                 | 8                                                                                 | 1                                                                                  | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   | 2                                                                                   |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 4.0                                                                               | 10.0                                                                              | 10.0                                                                              | 4.0                                                                               | 10.0                                                                              | 10.0                                                                              | 4.0                                                                                | 6.0                                                                                 |                                                                                     | 4.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 |
| Minimum Split (s)       | 8.0                                                                               | 15.7                                                                              | 15.7                                                                              | 8.0                                                                               | 15.7                                                                              | 15.7                                                                              | 8.0                                                                                | 11.5                                                                                |                                                                                     | 8.0                                                                                 | 11.5                                                                                | 11.5                                                                                |
| Total Split (s)         | 13.0                                                                              | 24.0                                                                              | 24.0                                                                              | 13.0                                                                              | 24.0                                                                              | 24.0                                                                              | 19.0                                                                               | 51.0                                                                                | 0.0                                                                                 | 12.0                                                                                | 44.0                                                                                | 44.0                                                                                |
| Total Split (%)         | 13.0%                                                                             | 24.0%                                                                             | 24.0%                                                                             | 13.0%                                                                             | 24.0%                                                                             | 24.0%                                                                             | 19.0%                                                                              | 51.0%                                                                               | 0.0%                                                                                | 12.0%                                                                               | 44.0%                                                                               | 44.0%                                                                               |
| Yellow Time (s)         | 3.5                                                                               | 3.9                                                                               | 3.9                                                                               | 3.5                                                                               | 3.9                                                                               | 3.9                                                                               | 3.5                                                                                | 3.6                                                                                 |                                                                                     | 3.5                                                                                 | 3.6                                                                                 | 3.6                                                                                 |
| All-Red Time (s)        | 0.5                                                                               | 1.8                                                                               | 1.8                                                                               | 0.5                                                                               | 1.8                                                                               | 1.8                                                                               | 0.5                                                                                | 1.9                                                                                 |                                                                                     | 0.5                                                                                 | 1.9                                                                                 | 1.9                                                                                 |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 5.7                                                                               | 5.7                                                                               | 4.0                                                                               | 5.7                                                                               | 5.7                                                                               | 4.0                                                                                | 5.5                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 5.5                                                                                 | 5.5                                                                                 |
| Lead/Lag                | Lead                                                                              | Lag                                                                               | Lag                                                                               | Lead                                                                              | Lag                                                                               | Lag                                                                               | Lag                                                                                | Lag                                                                                 |                                                                                     | Lead                                                                                | Lead                                                                                | Lead                                                                                |
| Lead-Lag Optimize?      | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                                | Yes                                                                                 |                                                                                     | Yes                                                                                 | Yes                                                                                 | Yes                                                                                 |
| Recall Mode             | None                                                                              | Max                                                                               | Max                                                                               | None                                                                              | Max                                                                               | Max                                                                               | None                                                                               | C-Max                                                                               |                                                                                     | None                                                                                | C-Max                                                                               | C-Max                                                                               |
| Act Effect Green (s)    | 28.8                                                                              | 18.3                                                                              | 18.3                                                                              | 28.9                                                                              | 18.3                                                                              | 18.3                                                                              | 49.7                                                                               | 48.2                                                                                |                                                                                     | 40.2                                                                                | 38.7                                                                                | 38.7                                                                                |
| Actuated g/C Ratio      | 0.29                                                                              | 0.18                                                                              | 0.18                                                                              | 0.29                                                                              | 0.18                                                                              | 0.18                                                                              | 0.50                                                                               | 0.48                                                                                |                                                                                     | 0.40                                                                                | 0.39                                                                                | 0.39                                                                                |
| v/c Ratio               | 0.42                                                                              | 0.77                                                                              | 0.71                                                                              | 0.52                                                                              | 0.32                                                                              | 0.15                                                                              | 0.50                                                                               | 0.74                                                                                |                                                                                     | 0.41                                                                                | 0.42                                                                                | 0.11                                                                                |
| Control Delay           | 28.9                                                                              | 47.9                                                                              | 14.4                                                                              | 28.5                                                                              | 37.0                                                                              | 11.2                                                                              | 9.4                                                                                | 6.9                                                                                 |                                                                                     | 25.0                                                                                | 23.7                                                                                | 5.3                                                                                 |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 |                                                                                     | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             | 28.9                                                                              | 47.9                                                                              | 14.4                                                                              | 28.5                                                                              | 37.0                                                                              | 11.2                                                                              | 9.4                                                                                | 6.9                                                                                 |                                                                                     | 25.0                                                                                | 23.7                                                                                | 5.3                                                                                 |
| LOS                     | C                                                                                 | D                                                                                 | B                                                                                 | C                                                                                 | D                                                                                 | B                                                                                 | A                                                                                  | A                                                                                   |                                                                                     | C                                                                                   | C                                                                                   | A                                                                                   |
| Approach Delay          |                                                                                   | 32.0                                                                              |                                                                                   |                                                                                   | 30.2                                                                              |                                                                                   |                                                                                    | 7.4                                                                                 |                                                                                     |                                                                                     | 22.1                                                                                |                                                                                     |
| Approach LOS            |                                                                                   | C                                                                                 |                                                                                   |                                                                                   | C                                                                                 |                                                                                   |                                                                                    | A                                                                                   |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 76                                                                                | 161                                                                               | 30                                                                                | 60                                                                                | 60                                                                                | 0                                                                                 | 59                                                                                 | 200                                                                                 |                                                                                     | 34                                                                                  | 140                                                                                 | 0                                                                                   |
| Queue Length 95th (ft)  | 129                                                                               | 218                                                                               | 136                                                                               | 91                                                                                | 94                                                                                | 32                                                                                | m55                                                                                | m161                                                                                |                                                                                     | 65                                                                                  | 188                                                                                 | 27                                                                                  |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 557                                                                               |                                                                                   |                                                                                   | 527                                                                               |                                                                                   |                                                                                    | 1222                                                                                |                                                                                     |                                                                                     | 436                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                                |                                                                                     |                                                                                     | 215                                                                                 |                                                                                     | 215                                                                                 |
| Base Capacity (vph)     | 391                                                                               | 648                                                                               | 589                                                                               | 495                                                                               | 649                                                                               | 332                                                                               | 546                                                                                | 1674                                                                                |                                                                                     | 217                                                                                 | 1369                                                                                | 656                                                                                 |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       | 0.41                                                                              | 0.77                                                                              | 0.71                                                                              | 0.52                                                                              | 0.32                                                                              | 0.15                                                                              | 0.50                                                                               | 0.74                                                                                |                                                                                     | 0.39                                                                                | 0.42                                                                                | 0.11                                                                                |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 64 (64%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 65

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.77

Intersection Signal Delay: 20.2

Intersection LOS: C

Intersection Capacity Utilization 72.7%

ICU Level of Service C

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: Century Ave & Centennial Rd

|                                                                                        |                                                                                        |                                                                                         |                                                                                          |
|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
|  ø2  |  ø1  |  ø3  |  ø4  |
| 44 s                                                                                   | 19 s                                                                                   | 13 s                                                                                    | 24 s                                                                                     |
|  ø5 |  ø6 |  ø7 |  ø8 |
| 12 s                                                                                   | 51 s                                                                                   | 13 s                                                                                    | 24 s                                                                                     |



**Appendix FF: 2059 - Signal at Trenton & NE Loop Ramp 6-Lane AM  
(4C1-6)**

Exit 161 Operational Study  
Bismarck, ND

1: Divide Ave & Bismarck Expy

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |                                                                                   |  |  |  |  |  |  |  |  |  |
| Volume (vph)            | 161                                                                               | 173                                                                               | 25                                                                                | 267                                                                               | 182                                                                               | 623                                                                               | 34                                                                                  | 578                                                                                 | 97                                                                                  | 462                                                                                 | 1584                                                                                | 353                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 150                                                                               |                                                                                   | 0                                                                                 | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                 |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                   |                                                                                     | 0                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 100                                                                               |                                                                                   | 25                                                                                | 100                                                                               |                                                                                   | 100                                                                               | 100                                                                                 |                                                                                     | 150                                                                                 | 100                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 25                                                                                |                                                                                   |                                                                                   | 25                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 371                                                                               |                                                                                   |                                                                                   | 341                                                                               |                                                                                   |                                                                                     | 614                                                                                 |                                                                                     |                                                                                     | 458                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 10.1                                                                              |                                                                                   |                                                                                   | 9.3                                                                               |                                                                                   |                                                                                     | 10.5                                                                                |                                                                                     |                                                                                     | 7.8                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 4%                                                                                | 1%                                                                                | 1%                                                                                | 11%                                                                               | 10%                                                                               | 22%                                                                               | 10%                                                                                 | 7%                                                                                  | 17%                                                                                 | 11%                                                                                 | 4%                                                                                  | 4%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 175                                                                               | 215                                                                               | 0                                                                                 | 290                                                                               | 198                                                                               | 677                                                                               | 37                                                                                  | 733                                                                                 | 0                                                                                   | 502                                                                                 | 2106                                                                                | 0                                                                                   |
| Turn Type               | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                              |                                                                                   | pm+ov                                                                             | Perm                                                                                |                                                                                     |                                                                                     | pm+pt                                                                               |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 | 5                                                                                 |                                                                                     | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 | 4                                                                                 |                                                                                   | 8                                                                                 | 8                                                                                 | 5                                                                                 | 6                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               | 6.0                                                                               |                                                                                   | 6.0                                                                               | 6.0                                                                               | 5.0                                                                               | 6.0                                                                                 | 6.0                                                                                 |                                                                                     | 5.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 30.0                                                                              | 30.0                                                                              |                                                                                   | 30.0                                                                              | 30.0                                                                              | 9.8                                                                               | 22.9                                                                                | 22.9                                                                                |                                                                                     | 9.8                                                                                 | 28.7                                                                                |                                                                                     |
| Total Split (s)         | 40.0                                                                              | 40.0                                                                              | 0.0                                                                               | 40.0                                                                              | 40.0                                                                              | 33.0                                                                              | 27.0                                                                                | 27.0                                                                                | 0.0                                                                                 | 33.0                                                                                | 60.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 40.0%                                                                             | 40.0%                                                                             | 0.0%                                                                              | 40.0%                                                                             | 40.0%                                                                             | 33.0%                                                                             | 27.0%                                                                               | 27.0%                                                                               | 0.0%                                                                                | 33.0%                                                                               | 60.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 3.0                                                                               | 3.9                                                                                 | 3.9                                                                                 |                                                                                     | 3.0                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 1.0                                                                               | 1.8                                                                                 | 1.8                                                                                 |                                                                                     | 1.0                                                                                 | 1.8                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 5.7                                                                                 | 5.7                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 5.7                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lead                                                                              | Lag                                                                                 | Lag                                                                                 |                                                                                     | Lead                                                                                |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                               | Yes                                                                                 | Yes                                                                                 |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     |
| Recall Mode             | None                                                                              | None                                                                              |                                                                                   | None                                                                              | None                                                                              | None                                                                              | C-Min                                                                               | C-Min                                                                               |                                                                                     | None                                                                                | C-Min                                                                               |                                                                                     |
| Act Effect Green (s)    | 32.0                                                                              | 32.0                                                                              |                                                                                   | 32.0                                                                              | 32.0                                                                              | 65.0                                                                              | 25.3                                                                                | 25.3                                                                                |                                                                                     | 58.0                                                                                | 56.3                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.32                                                                              | 0.32                                                                              |                                                                                   | 0.32                                                                              | 0.32                                                                              | 0.65                                                                              | 0.25                                                                                | 0.25                                                                                |                                                                                     | 0.58                                                                                | 0.56                                                                                |                                                                                     |
| v/c Ratio               | 0.51                                                                              | 0.36                                                                              |                                                                                   | 0.94                                                                              | 0.36                                                                              | 0.78                                                                              | 0.54                                                                                | 0.61                                                                                |                                                                                     | 0.90                                                                                | 0.76                                                                                |                                                                                     |
| Control Delay           | 33.1                                                                              | 26.5                                                                              |                                                                                   | 73.6                                                                              | 27.7                                                                              | 18.9                                                                              | 67.6                                                                                | 35.4                                                                                |                                                                                     | 37.6                                                                                | 11.7                                                                                |                                                                                     |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 |                                                                                     | 0.0                                                                                 | 0.3                                                                                 |                                                                                     |
| Total Delay             | 33.1                                                                              | 26.5                                                                              |                                                                                   | 73.6                                                                              | 27.7                                                                              | 18.9                                                                              | 67.6                                                                                | 35.4                                                                                |                                                                                     | 37.6                                                                                | 12.0                                                                                |                                                                                     |
| LOS                     | C                                                                                 | C                                                                                 |                                                                                   | E                                                                                 | C                                                                                 | B                                                                                 | E                                                                                   | D                                                                                   |                                                                                     | D                                                                                   | B                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 29.5                                                                              |                                                                                   |                                                                                   | 34.0                                                                              |                                                                                   |                                                                                     | 37.0                                                                                |                                                                                     |                                                                                     | 16.9                                                                                |                                                                                     |
| Approach LOS            |                                                                                   | C                                                                                 |                                                                                   |                                                                                   | C                                                                                 |                                                                                   |                                                                                     | D                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 87                                                                                | 97                                                                                |                                                                                   | 173                                                                               | 93                                                                                | 232                                                                               | 22                                                                                  | 153                                                                                 |                                                                                     | 180                                                                                 | 220                                                                                 |                                                                                     |
| Queue Length 95th (ft)  | 154                                                                               | 159                                                                               |                                                                                   | #332                                                                              | 153                                                                               | 389                                                                               | #77                                                                                 | 198                                                                                 |                                                                                     | #406                                                                                | 247                                                                                 |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 291                                                                               |                                                                                   |                                                                                   | 261                                                                               |                                                                                   |                                                                                    | 534                                                                                 |                                                                                     |                                                                                     | 378                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 150                                                                               |                                                                                   |                                                                                   | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                |                                                                                     |                                                                                     | 400                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 364                                                                               | 633                                                                               |                                                                                   | 326                                                                               | 587                                                                               | 894                                                                               | 69                                                                                 | 1206                                                                                |                                                                                     | 582                                                                                 | 2768                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 191                                                                                 |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.48                                                                              | 0.34                                                                              |                                                                                   | 0.89                                                                              | 0.34                                                                              | 0.76                                                                              | 0.54                                                                               | 0.61                                                                                |                                                                                     | 0.86                                                                                | 0.82                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 44 (44%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.94

Intersection Signal Delay: 25.1

Intersection LOS: C

Intersection Capacity Utilization 88.4%

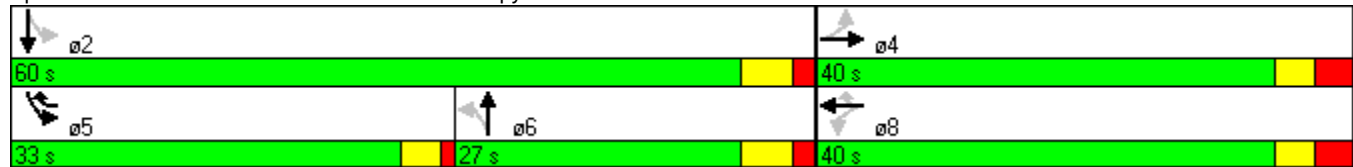
ICU Level of Service E

Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 1: Divide Ave & Bismarck Expy



|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |                                                                                   |  |                                                                                   |                                                                                   |                                                                                   |                                                                                    |  |  |  |  |                                                                                     |
| Volume (vph)            | 188                                                                               | 0                                                                                 | 764                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 926                                                                                 | 135                                                                                 | 39                                                                                  | 1528                                                                                | 0                                                                                   |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                 | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 200                                                                               |                                                                                   | 200                                                                               | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  |                                                                                     | 0                                                                                   | 222                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 2                                                                                 |                                                                                   | 2                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                  |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 300                                                                               | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                 |                                                                                     | 25                                                                                  | 150                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                    |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                    | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 575                                                                               |                                                                                   |                                                                                   | 383                                                                               |                                                                                   |                                                                                    | 458                                                                                 |                                                                                     |                                                                                     | 769                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 13.1                                                                              |                                                                                   |                                                                                   | 8.7                                                                               |                                                                                   |                                                                                    | 7.8                                                                                 |                                                                                     |                                                                                     | 13.1                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                               | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                               | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 3%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                 | 8%                                                                                  | 27%                                                                                 | 10%                                                                                 | 9%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 204                                                                               | 0                                                                                 | 830                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 1007                                                                                | 147                                                                                 | 42                                                                                  | 1661                                                                                | 0                                                                                   |
| Turn Type               | custom                                                                            |                                                                                   | custom                                                                            |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     | Perm                                                                                | Perm                                                                                |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     | 6                                                                                   | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                   | 6                                                                                   | 2                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               |                                                                                   | 6.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 21.1                                                                              |                                                                                   | 21.1                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 23.4                                                                                | 23.4                                                                                | 21.4                                                                                | 21.4                                                                                |                                                                                     |
| Total Split (s)         | 46.0                                                                              | 0.0                                                                               | 46.0                                                                              | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 54.0                                                                                | 54.0                                                                                | 54.0                                                                                | 54.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 46.0%                                                                             | 0.0%                                                                              | 46.0%                                                                             | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                               | 54.0%                                                                               | 54.0%                                                                               | 54.0%                                                                               | 54.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.6                                                                               |                                                                                   | 3.6                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 1.5                                                                               |                                                                                   | 1.5                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 1.5                                                                                 | 1.5                                                                                 | 1.5                                                                                 | 1.5                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 5.1                                                                               | 4.0                                                                               | 5.1                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                                | 5.4                                                                                 | 5.4                                                                                 | 5.4                                                                                 | 5.4                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Recall Mode             | None                                                                              |                                                                                   | None                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               |                                                                                     |
| Act Effct Green (s)     | 35.2                                                                              |                                                                                   | 35.2                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 54.3                                                                                | 54.3                                                                                | 54.3                                                                                | 54.3                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.35                                                                              |                                                                                   | 0.35                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.54                                                                                | 0.54                                                                                | 0.54                                                                                | 0.54                                                                                |                                                                                     |
| v/c Ratio               | 0.17                                                                              |                                                                                   | 0.84                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.39                                                                                | 0.19                                                                                | 0.19                                                                                | 0.64                                                                                |                                                                                     |
| Control Delay           | 21.7                                                                              |                                                                                   | 37.1                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 13.2                                                                                | 3.6                                                                                 | 9.1                                                                                 | 12.7                                                                                |                                                                                     |
| Queue Delay             | 0.0                                                                               |                                                                                   | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |
| Total Delay             | 21.7                                                                              |                                                                                   | 37.1                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 13.2                                                                                | 3.6                                                                                 | 9.1                                                                                 | 12.7                                                                                |                                                                                     |
| LOS                     | C                                                                                 |                                                                                   | D                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | B                                                                                   | A                                                                                   | A                                                                                   | B                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 12.0                                                                                |                                                                                     |                                                                                     | 12.6                                                                                |                                                                                     |
| Approach LOS            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | B                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 44                                                                                |                                                                                   | 263                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 120                                                                                 | 9                                                                                   | 9                                                                                   | 253                                                                                 |                                                                                     |
| Queue Length 95th (ft)  | 64                                                                                |                                                                                   | 322                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 145                                                                                 | m20                                                                                 | m15                                                                                 | 259                                                                                 |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 495                                                                               |                                                                                   |                                                                                   | 303                                                                               |                                                                                   |                                                                                    | 378                                                                                 |                                                                                     |                                                                                     | 689                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 200                                                                               |                                                                                   | 200                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | 222                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 1391                                                                              |                                                                                   | 1150                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 2608                                                                                | 758                                                                                 | 226                                                                                 | 2584                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.15                                                                              |                                                                                   | 0.72                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.39                                                                                | 0.19                                                                                | 0.19                                                                                | 0.64                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 22 (22%), Referenced to phase 2:SBTL and 6:NBT, Start of Green

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.84

Intersection Signal Delay: 18.1

Intersection LOS: B

Intersection Capacity Utilization 65.0%

ICU Level of Service C

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: South Ramp & Centennial Rd

|                                                                                        |                                                                                       |
|----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|  ø2  |  ø4 |
| 54 s                                                                                   | 46 s                                                                                  |
|  ø6 |                                                                                       |
| 54 s                                                                                   |                                                                                       |

|                         |  |      |      |                                                                                   |      |                                                                                   |      |                                                                                     |                                                                                     |      |                                                                                     |                                                                                     |
|-------------------------|------------------------------------------------------------------------------------|------|------|-----------------------------------------------------------------------------------|------|-----------------------------------------------------------------------------------|------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                                | EBT  | EBR  | WBL                                                                               | WBT  | WBR                                                                               | NBL  | NBT                                                                                 | NBR                                                                                 | SBL  | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |                                                                                    |      |      |  |      |  |      |  |  |      |  |  |
| Volume (vph)            | 0                                                                                  | 0    | 0    | 193                                                                               | 0    | 19                                                                                | 0    | 573                                                                                 | 447                                                                                 | 0    | 2128                                                                                | 475                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                               | 1900 | 1900 | 1900                                                                              | 1900 | 1900                                                                              | 1900 | 1900                                                                                | 1900                                                                                | 1900 | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                 | 12   | 12   | 16                                                                                | 12   | 12                                                                                | 12   | 12                                                                                  | 12                                                                                  | 12   | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                    | 0%   |      |                                                                                   | 0%   |                                                                                   |      | 0%                                                                                  |                                                                                     |      | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 0                                                                                  |      | 0    | 0                                                                                 |      | 150                                                                               | 0    |                                                                                     | 215                                                                                 | 0    |                                                                                     | 200                                                                                 |
| Storage Lanes           | 0                                                                                  |      | 0    | 1                                                                                 |      | 1                                                                                 | 0    |                                                                                     | 1                                                                                   | 0    |                                                                                     | 1                                                                                   |
| Taper Length (ft)       | 25                                                                                 |      | 25   | 25                                                                                |      | 100                                                                               | 150  |                                                                                     | 25                                                                                  | 25   |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                    |      | Yes  |                                                                                   |      | Yes                                                                               |      |                                                                                     | Yes                                                                                 |      |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                    | 30   |      |                                                                                   | 30   |                                                                                   |      | 40                                                                                  |                                                                                     |      | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                    | 270  |      |                                                                                   | 465  |                                                                                   |      | 769                                                                                 |                                                                                     |      | 782                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                    | 6.1  |      |                                                                                   | 10.6 |                                                                                   |      | 13.1                                                                                |                                                                                     |      | 13.3                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                    |      |      |                                                                                   |      |                                                                                   |      |                                                                                     |                                                                                     |      |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                    |      |      |                                                                                   |      |                                                                                   |      |                                                                                     |                                                                                     |      |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                               | 0.92 | 0.92 | 0.92                                                                              | 0.92 | 0.92                                                                              | 0.92 | 0.92                                                                                | 0.92                                                                                | 0.92 | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                               | 100% | 100% | 100%                                                                              | 100% | 100%                                                                              | 100% | 100%                                                                                | 100%                                                                                | 100% | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                 | 2%   | 2%   | 12%                                                                               | 2%   | 8%                                                                                | 6%   | 3%                                                                                  | 2%                                                                                  | 2%   | 3%                                                                                  | 1%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                  | 0    | 0    | 0                                                                                 | 0    | 0                                                                                 | 0    | 0                                                                                   | 0                                                                                   | 0    | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                    |      |      |                                                                                   |      |                                                                                   |      |                                                                                     |                                                                                     |      |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                    | 0%   |      |                                                                                   | 0%   |                                                                                   |      | 0%                                                                                  |                                                                                     |      | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                    |      |      |                                                                                   |      |                                                                                   |      |                                                                                     |                                                                                     |      |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 0                                                                                  | 0    | 0    | 210                                                                               | 0    | 21                                                                                | 0    | 623                                                                                 | 486                                                                                 | 0    | 2313                                                                                | 516                                                                                 |
| Turn Type               |                                                                                    |      |      | custom                                                                            |      | custom                                                                            |      |                                                                                     | Free                                                                                |      |                                                                                     | Perm                                                                                |
| Protected Phases        |                                                                                    |      |      |                                                                                   |      |                                                                                   |      | 6                                                                                   |                                                                                     |      | 2                                                                                   |                                                                                     |
| Permitted Phases        |                                                                                    |      |      | 8                                                                                 |      | 8                                                                                 |      |                                                                                     | Free                                                                                |      |                                                                                     | 2                                                                                   |
| Detector Phase          |                                                                                    |      |      | 8                                                                                 |      | 8                                                                                 |      | 6                                                                                   |                                                                                     |      | 2                                                                                   | 2                                                                                   |
| Switch Phase            |                                                                                    |      |      |                                                                                   |      |                                                                                   |      |                                                                                     |                                                                                     |      |                                                                                     |                                                                                     |
| Minimum Initial (s)     |                                                                                    |      |      | 5.0                                                                               |      | 5.0                                                                               |      | 10.0                                                                                |                                                                                     |      | 10.0                                                                                | 10.0                                                                                |
| Minimum Split (s)       |                                                                                    |      |      | 20.0                                                                              |      | 20.0                                                                              |      | 20.0                                                                                |                                                                                     |      | 22.4                                                                                | 22.4                                                                                |
| Total Split (s)         | 0.0                                                                                | 0.0  | 0.0  | 28.0                                                                              | 0.0  | 28.0                                                                              | 0.0  | 72.0                                                                                | 0.0                                                                                 | 0.0  | 72.0                                                                                | 72.0                                                                                |
| Total Split (%)         | 0.0%                                                                               | 0.0% | 0.0% | 28.0%                                                                             | 0.0% | 28.0%                                                                             | 0.0% | 72.0%                                                                               | 0.0%                                                                                | 0.0% | 72.0%                                                                               | 72.0%                                                                               |
| Yellow Time (s)         |                                                                                    |      |      | 3.2                                                                               |      | 3.2                                                                               |      | 3.9                                                                                 |                                                                                     |      | 3.9                                                                                 | 3.9                                                                                 |
| All-Red Time (s)        |                                                                                    |      |      | 2.0                                                                               |      | 2.0                                                                               |      | 1.5                                                                                 |                                                                                     |      | 1.5                                                                                 | 1.5                                                                                 |
| Lost Time Adjust (s)    | 0.0                                                                                | 0.0  | 0.0  | 0.0                                                                               | 0.0  | 0.0                                                                               | 0.0  | 0.0                                                                                 | 0.0                                                                                 | 0.0  | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                                | 4.0  | 4.0  | 5.2                                                                               | 4.0  | 5.2                                                                               | 4.0  | 5.4                                                                                 | 4.0                                                                                 | 4.0  | 5.4                                                                                 | 5.4                                                                                 |
| Lead/Lag                |                                                                                    |      |      |                                                                                   |      |                                                                                   |      |                                                                                     |                                                                                     |      |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                    |      |      |                                                                                   |      |                                                                                   |      |                                                                                     |                                                                                     |      |                                                                                     |                                                                                     |
| Recall Mode             |                                                                                    |      |      | None                                                                              |      | None                                                                              |      | C-Min                                                                               |                                                                                     |      | C-Min                                                                               | C-Min                                                                               |
| Act Effect Green (s)    |                                                                                    |      |      | 15.8                                                                              |      | 15.8                                                                              |      | 73.6                                                                                | 100.0                                                                               |      | 73.6                                                                                | 73.6                                                                                |
| Actuated g/C Ratio      |                                                                                    |      |      | 0.16                                                                              |      | 0.16                                                                              |      | 0.74                                                                                | 1.00                                                                                |      | 0.74                                                                                | 0.74                                                                                |
| v/c Ratio               |                                                                                    |      |      | 0.73                                                                              |      | 0.08                                                                              |      | 0.17                                                                                | 0.31                                                                                |      | 0.62                                                                                | 0.39                                                                                |
| Control Delay           |                                                                                    |      |      | 54.2                                                                              |      | 13.8                                                                              |      | 4.9                                                                                 | 1.1                                                                                 |      | 3.6                                                                                 | 0.8                                                                                 |
| Queue Delay             |                                                                                    |      |      | 0.0                                                                               |      | 0.0                                                                               |      | 0.0                                                                                 | 0.0                                                                                 |      | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             |                                                                                    |      |      | 54.2                                                                              |      | 13.8                                                                              |      | 4.9                                                                                 | 1.1                                                                                 |      | 3.6                                                                                 | 0.8                                                                                 |
| LOS                     |                                                                                    |      |      | D                                                                                 |      | B                                                                                 |      | A                                                                                   | A                                                                                   |      | A                                                                                   | A                                                                                   |
| Approach Delay          |                                                                                    |      |      |                                                                                   |      |                                                                                   |      | 3.2                                                                                 |                                                                                     |      | 3.1                                                                                 |                                                                                     |
| Approach LOS            |                                                                                    |      |      |                                                                                   |      |                                                                                   |      | A                                                                                   |                                                                                     |      | A                                                                                   |                                                                                     |
| Queue Length 50th (ft)  |                                                                                    |      |      | 129                                                                               |      | 0                                                                                 |      | 54                                                                                  | 14                                                                                  |      | 101                                                                                 | 3                                                                                   |
| Queue Length 95th (ft)  |                                                                                    |      |      | 193                                                                               |      | 20                                                                                |      | 69                                                                                  | 34                                                                                  |      | 115                                                                                 | 3                                                                                   |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 190                                                                               |                                                                                   |                                                                                   | 385                                                                               |                                                                                   |                                                                                    | 689                                                                                 |                                                                                     |                                                                                     | 702                                                                                 |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 150                                                                               |                                                                                    |                                                                                     | 215                                                                                 |                                                                                     |                                                                                     | 200                                                                                 |
| Base Capacity (vph)     |                                                                                   |                                                                                   |                                                                                   | 416                                                                               |                                                                                   | 357                                                                               |                                                                                    | 3706                                                                                | 1583                                                                                |                                                                                     | 3706                                                                                | 1313                                                                                |
| Starvation Cap Reductn  |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                    | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                    | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                    | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       |                                                                                   |                                                                                   |                                                                                   | 0.50                                                                              |                                                                                   | 0.06                                                                              |                                                                                    | 0.17                                                                                | 0.31                                                                                |                                                                                     | 0.62                                                                                | 0.39                                                                                |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 90 (90%), Referenced to phase 2:SBT and 6:NBT, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.73

Intersection Signal Delay: 5.7

Intersection LOS: A

Intersection Capacity Utilization 59.6%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 3: North Ramp & Centennial Rd



|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |                                                                                   |  |  |  |  |                                                                                   |  |  |  |  |  |  |
| Volume (vph)            | 14                                                                                | 2                                                                                 | 423                                                                               | 177                                                                               | 9                                                                                 | 79                                                                                | 107                                                                                 | 595                                                                                 | 140                                                                                 | 22                                                                                  | 1755                                                                                | 29                                                                                  |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 0                                                                                 |                                                                                   | 200                                                                               | 200                                                                               |                                                                                   | 200                                                                               | 530                                                                                 |                                                                                     | 0                                                                                   | 215                                                                                 |                                                                                     | 150                                                                                 |
| Storage Lanes           | 0                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                   |                                                                                     | 0                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                  |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 632                                                                               |                                                                                   |                                                                                   | 937                                                                               |                                                                                   |                                                                                     | 782                                                                                 |                                                                                     |                                                                                     | 1308                                                                                |                                                                                     |
| Travel Time (s)         |                                                                                   | 14.4                                                                              |                                                                                   |                                                                                   | 21.3                                                                              |                                                                                   |                                                                                     | 13.3                                                                                |                                                                                     |                                                                                     | 22.3                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 0                                                                                 | 17                                                                                | 460                                                                               | 192                                                                               | 96                                                                                | 0                                                                                 | 116                                                                                 | 799                                                                                 | 0                                                                                   | 24                                                                                  | 1940                                                                                | 0                                                                                   |
| Turn Type               | Perm                                                                              |                                                                                   | Perm                                                                              | Perm                                                                              |                                                                                   |                                                                                   | pm+pt                                                                               |                                                                                     |                                                                                     | Perm                                                                                |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 | 8                                                                                 |                                                                                   |                                                                                   | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 | 4                                                                                 | 4                                                                                 | 8                                                                                 | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     | 2                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               |                                                                                   | 5.0                                                                                 | 4.0                                                                                 |                                                                                     | 4.0                                                                                 | 4.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              |                                                                                   | 9.0                                                                                 | 20.0                                                                                |                                                                                     | 20.0                                                                                | 20.0                                                                                |                                                                                     |
| Total Split (s)         | 37.0                                                                              | 37.0                                                                              | 37.0                                                                              | 37.0                                                                              | 37.0                                                                              | 0.0                                                                               | 12.0                                                                                | 63.0                                                                                | 0.0                                                                                 | 51.0                                                                                | 51.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 37.0%                                                                             | 37.0%                                                                             | 37.0%                                                                             | 37.0%                                                                             | 37.0%                                                                             | 0.0%                                                                              | 12.0%                                                                               | 63.0%                                                                               | 0.0%                                                                                | 51.0%                                                                               | 51.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               |                                                                                   | 3.5                                                                                 | 3.5                                                                                 |                                                                                     | 3.5                                                                                 | 3.5                                                                                 |                                                                                     |
| All-Red Time (s)        | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               |                                                                                   | 0.5                                                                                 | 0.5                                                                                 |                                                                                     | 0.5                                                                                 | 0.5                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lag                                                                                 |                                                                                     |                                                                                     | Lead                                                                                | Lead                                                                                |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 | Yes                                                                                 |                                                                                     |
| Recall Mode             | None                                                                              | None                                                                              | None                                                                              | None                                                                              | None                                                                              |                                                                                   | None                                                                                | C-Min                                                                               |                                                                                     | C-Min                                                                               | C-Min                                                                               |                                                                                     |
| Act Effect Green (s)    |                                                                                   | 25.5                                                                              | 25.5                                                                              | 25.5                                                                              | 25.5                                                                              |                                                                                   | 66.5                                                                                | 66.5                                                                                |                                                                                     | 55.7                                                                                | 55.7                                                                                |                                                                                     |
| Actuated g/C Ratio      |                                                                                   | 0.26                                                                              | 0.26                                                                              | 0.26                                                                              | 0.26                                                                              |                                                                                   | 0.66                                                                                | 0.66                                                                                |                                                                                     | 0.56                                                                                | 0.56                                                                                |                                                                                     |
| v/c Ratio               |                                                                                   | 0.04                                                                              | 0.88                                                                              | 0.54                                                                              | 0.20                                                                              |                                                                                   | 0.60                                                                                | 0.24                                                                                |                                                                                     | 0.07                                                                                | 0.69                                                                                |                                                                                     |
| Control Delay           |                                                                                   | 24.6                                                                              | 40.4                                                                              | 36.6                                                                              | 7.8                                                                               |                                                                                   | 38.4                                                                                | 6.4                                                                                 |                                                                                     | 6.4                                                                                 | 9.0                                                                                 |                                                                                     |
| Queue Delay             |                                                                                   | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                                 | 0.0                                                                                 |                                                                                     | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |
| Total Delay             |                                                                                   | 24.6                                                                              | 40.4                                                                              | 36.6                                                                              | 7.8                                                                               |                                                                                   | 38.4                                                                                | 6.4                                                                                 |                                                                                     | 6.4                                                                                 | 9.0                                                                                 |                                                                                     |
| LOS                     |                                                                                   | C                                                                                 | D                                                                                 | D                                                                                 | A                                                                                 |                                                                                   | D                                                                                   | A                                                                                   |                                                                                     | A                                                                                   | A                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 39.8                                                                              |                                                                                   |                                                                                   | 27.0                                                                              |                                                                                   |                                                                                     | 10.4                                                                                |                                                                                     |                                                                                     | 9.0                                                                                 |                                                                                     |
| Approach LOS            |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | C                                                                                 |                                                                                   |                                                                                     | B                                                                                   |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |
| Queue Length 50th (ft)  |                                                                                   | 8                                                                                 | 186                                                                               | 104                                                                               | 5                                                                                 |                                                                                   | 12                                                                                  | 24                                                                                  |                                                                                     | 4                                                                                   | 177                                                                                 |                                                                                     |
| Queue Length 95th (ft)  |                                                                                   | 23                                                                                | 293                                                                               | 159                                                                               | 39                                                                                |                                                                                   | 83                                                                                  | 69                                                                                  |                                                                                     | m4                                                                                  | m180                                                                                |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 552                                                                               |                                                                                   |                                                                                   | 857                                                                               |                                                                                   |                                                                                    | 702                                                                                 |                                                                                     |                                                                                     | 1228                                                                                |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   | 200                                                                               | 200                                                                               |                                                                                   |                                                                                   | 530                                                                                |                                                                                     |                                                                                     | 215                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     |                                                                                   | 508                                                                               | 631                                                                               | 459                                                                               | 590                                                                               |                                                                                   | 216                                                                                | 3314                                                                                |                                                                                     | 336                                                                                 | 2829                                                                                |                                                                                     |
| Starvation Cap Reductn  |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       |                                                                                   | 0.03                                                                              | 0.73                                                                              | 0.42                                                                              | 0.16                                                                              |                                                                                   | 0.54                                                                               | 0.24                                                                                |                                                                                     | 0.07                                                                                | 0.69                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 96 (96%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.88

Intersection Signal Delay: 14.8

Intersection LOS: B

Intersection Capacity Utilization 80.6%

ICU Level of Service D

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Trenton Dr & Centennial Rd

|                                                                                        |                                                                                         |                                                                                        |
|----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
|  ø2  |  ø1   |  ø4 |
| 51 s                                                                                   | 12 s                                                                                    | 37 s                                                                                   |
|  ø6 |  ø8 |                                                                                        |
| 63 s                                                                                   |                                                                                         | 37 s                                                                                   |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |  |  |  |  |  |  |                                                                                     |  |  |  |
| Volume (vph)            | 47                                                                                | 64                                                                                | 415                                                                               | 1147                                                                              | 475                                                                               | 62                                                                                | 182                                                                                 | 399                                                                                 | 38                                                                                  | 44                                                                                  | 1921                                                                                | 173                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                                 |                                                                                     | 0                                                                                   | 215                                                                                 |                                                                                     | 215                                                                                 |
| Storage Lanes           | 1                                                                                 |                                                                                   | 1                                                                                 | 2                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                   |                                                                                     | 0                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                  |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 35                                                                                |                                                                                   |                                                                                   | 35                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 505                                                                               |                                                                                   |                                                                                   | 579                                                                               |                                                                                   |                                                                                     | 1308                                                                                |                                                                                     |                                                                                     | 512                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 9.8                                                                               |                                                                                   |                                                                                   | 11.3                                                                              |                                                                                   |                                                                                     | 22.3                                                                                |                                                                                     |                                                                                     | 8.7                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 51                                                                                | 70                                                                                | 451                                                                               | 1247                                                                              | 516                                                                               | 67                                                                                | 198                                                                                 | 475                                                                                 | 0                                                                                   | 48                                                                                  | 2276                                                                                | 0                                                                                   |
| Turn Type               | pm+pt                                                                             |                                                                                   | Perm                                                                              | pm+pt                                                                             |                                                                                   | Perm                                                                              | pm+pt                                                                               |                                                                                     |                                                                                     | pm+pt                                                                               |                                                                                     |                                                                                     |
| Protected Phases        | 7                                                                                 | 4                                                                                 |                                                                                   | 3                                                                                 | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 7                                                                                 | 4                                                                                 | 4                                                                                 | 3                                                                                 | 8                                                                                 | 8                                                                                 | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 4.0                                                                               | 10.0                                                                              | 10.0                                                                              | 4.0                                                                               | 10.0                                                                              | 10.0                                                                              | 4.0                                                                                 | 6.0                                                                                 |                                                                                     | 4.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 8.0                                                                               | 15.7                                                                              | 15.7                                                                              | 8.0                                                                               | 15.7                                                                              | 15.7                                                                              | 8.0                                                                                 | 11.5                                                                                |                                                                                     | 8.0                                                                                 | 11.5                                                                                |                                                                                     |
| Total Split (s)         | 12.0                                                                              | 24.0                                                                              | 24.0                                                                              | 24.0                                                                              | 36.0                                                                              | 36.0                                                                              | 12.0                                                                                | 40.0                                                                                | 0.0                                                                                 | 12.0                                                                                | 40.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 12.0%                                                                             | 24.0%                                                                             | 24.0%                                                                             | 24.0%                                                                             | 36.0%                                                                             | 36.0%                                                                             | 12.0%                                                                               | 40.0%                                                                               | 0.0%                                                                                | 12.0%                                                                               | 40.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.5                                                                               | 3.9                                                                               | 3.9                                                                               | 3.5                                                                               | 3.9                                                                               | 3.9                                                                               | 3.5                                                                                 | 3.6                                                                                 |                                                                                     | 3.5                                                                                 | 3.6                                                                                 |                                                                                     |
| All-Red Time (s)        | 0.5                                                                               | 1.8                                                                               | 1.8                                                                               | 0.5                                                                               | 1.8                                                                               | 1.8                                                                               | 0.5                                                                                 | 1.9                                                                                 |                                                                                     | 0.5                                                                                 | 1.9                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 5.7                                                                               | 5.7                                                                               | 4.0                                                                               | 5.7                                                                               | 5.7                                                                               | 4.0                                                                                 | 5.5                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 5.5                                                                                 | 4.0                                                                                 |
| Lead/Lag                | Lead                                                                              | Lag                                                                               | Lag                                                                               | Lead                                                                              | Lag                                                                               | Lag                                                                               | Lag                                                                                 | Lag                                                                                 |                                                                                     | Lead                                                                                | Lead                                                                                |                                                                                     |
| Lead-Lag Optimize?      | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                                 | Yes                                                                                 |                                                                                     | Yes                                                                                 | Yes                                                                                 |                                                                                     |
| Recall Mode             | None                                                                              | Max                                                                               | Max                                                                               | None                                                                              | Max                                                                               | Max                                                                               | None                                                                                | C-Max                                                                               |                                                                                     | None                                                                                | C-Max                                                                               |                                                                                     |
| Act Effect Green (s)    | 27.0                                                                              | 18.3                                                                              | 18.3                                                                              | 44.0                                                                              | 33.2                                                                              | 33.2                                                                              | 41.0                                                                                | 39.5                                                                                |                                                                                     | 36.0                                                                                | 34.5                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.27                                                                              | 0.18                                                                              | 0.18                                                                              | 0.44                                                                              | 0.33                                                                              | 0.33                                                                              | 0.41                                                                                | 0.40                                                                                |                                                                                     | 0.36                                                                                | 0.34                                                                                |                                                                                     |
| v/c Ratio               | 0.17                                                                              | 0.11                                                                              | 1.12                                                                              | 1.04                                                                              | 0.44                                                                              | 0.12                                                                              | 0.88                                                                                | 0.24                                                                                |                                                                                     | 0.15                                                                                | 1.31                                                                                |                                                                                     |
| Control Delay           | 19.1                                                                              | 34.6                                                                              | 111.3                                                                             | 64.6                                                                              | 28.4                                                                              | 7.1                                                                               | 62.4                                                                                | 12.9                                                                                |                                                                                     | 22.3                                                                                | 171.4                                                                               |                                                                                     |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 |                                                                                     | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |
| Total Delay             | 19.1                                                                              | 34.6                                                                              | 111.3                                                                             | 64.6                                                                              | 28.4                                                                              | 7.1                                                                               | 62.4                                                                                | 12.9                                                                                |                                                                                     | 22.3                                                                                | 171.4                                                                               |                                                                                     |
| LOS                     | B                                                                                 | C                                                                                 | F                                                                                 | E                                                                                 | C                                                                                 | A                                                                                 | E                                                                                   | B                                                                                   |                                                                                     | C                                                                                   | F                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 93.7                                                                              |                                                                                   |                                                                                   | 52.3                                                                              |                                                                                   |                                                                                     | 27.5                                                                                |                                                                                     |                                                                                     | 168.3                                                                               |                                                                                     |
| Approach LOS            |                                                                                   | F                                                                                 |                                                                                   |                                                                                   | D                                                                                 |                                                                                   |                                                                                     | C                                                                                   |                                                                                     |                                                                                     | F                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 18                                                                                | 20                                                                                | ~259                                                                              | ~377                                                                              | 138                                                                               | 0                                                                                 | 76                                                                                  | 57                                                                                  |                                                                                     | 20                                                                                  | ~688                                                                                |                                                                                     |
| Queue Length 95th (ft)  | 40                                                                                | 40                                                                                | #455                                                                              | #576                                                                              | 191                                                                               | 30                                                                                | #206                                                                                | 58                                                                                  |                                                                                     | 44                                                                                  | #786                                                                                |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 425                                                                               |                                                                                   |                                                                                   | 499                                                                               |                                                                                   |                                                                                     | 1228                                                                                |                                                                                     |                                                                                     | 432                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                                 |                                                                                     |                                                                                     | 215                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 313                                                                               | 648                                                                               | 401                                                                               | 1195                                                                              | 1176                                                                              | 571                                                                               | 226                                                                                 | 1991                                                                                |                                                                                     | 340                                                                                 | 1744                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.16                                                                              | 0.11                                                                              | 1.12                                                                              | 1.04                                                                              | 0.44                                                                              | 0.12                                                                              | 0.88                                                                                | 0.24                                                                                |                                                                                     | 0.14                                                                                | 1.31                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 98 (98%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 140

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.31

Intersection Signal Delay: 103.5

Intersection LOS: F

Intersection Capacity Utilization 112.1%

ICU Level of Service H

Analysis Period (min) 15

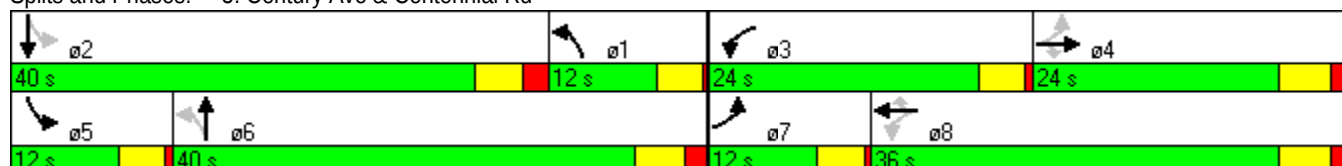
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 5: Century Ave & Centennial Rd





**Appendix GG: 2059 - Signal at Trenton & NE Loop Ramp 6-Lane PM  
(4C2-6)**

Exit 161 Operational Study  
Bismarck, ND

1: Divide Ave & Bismarck Expy

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |                                                                                   |  |  |  |  |  |  |  |  |  |
| Volume (vph)            | 408                                                                               | 80                                                                                | 35                                                                                | 213                                                                               | 174                                                                               | 778                                                                               | 32                                                                                  | 1148                                                                                | 81                                                                                  | 291                                                                                 | 1240                                                                                | 188                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 150                                                                               |                                                                                   | 0                                                                                 | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                 |                                                                                     | 200                                                                                 | 400                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                   |                                                                                     | 0                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 100                                                                               |                                                                                   | 25                                                                                | 100                                                                               |                                                                                   | 100                                                                               | 100                                                                                 |                                                                                     | 150                                                                                 | 100                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 25                                                                                |                                                                                   |                                                                                   | 25                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 371                                                                               |                                                                                   |                                                                                   | 341                                                                               |                                                                                   |                                                                                     | 614                                                                                 |                                                                                     |                                                                                     | 458                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 10.1                                                                              |                                                                                   |                                                                                   | 9.3                                                                               |                                                                                   |                                                                                     | 10.5                                                                                |                                                                                     |                                                                                     | 7.8                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 4%                                                                                | 1%                                                                                | 1%                                                                                | 11%                                                                               | 10%                                                                               | 22%                                                                               | 10%                                                                                 | 7%                                                                                  | 17%                                                                                 | 11%                                                                                 | 4%                                                                                  | 4%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 443                                                                               | 125                                                                               | 0                                                                                 | 232                                                                               | 189                                                                               | 846                                                                               | 35                                                                                  | 1336                                                                                | 0                                                                                   | 316                                                                                 | 1552                                                                                | 0                                                                                   |
| Turn Type               | Perm                                                                              |                                                                                   |                                                                                   | Perm                                                                              |                                                                                   | pm+ov                                                                             | Perm                                                                                |                                                                                     |                                                                                     | pm+pt                                                                               |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 | 5                                                                                 |                                                                                     | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 | 4                                                                                 |                                                                                   | 8                                                                                 | 8                                                                                 | 5                                                                                 | 6                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               | 6.0                                                                               |                                                                                   | 6.0                                                                               | 6.0                                                                               | 5.0                                                                               | 6.0                                                                                 | 6.0                                                                                 |                                                                                     | 5.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 30.0                                                                              | 30.0                                                                              |                                                                                   | 30.0                                                                              | 30.0                                                                              | 9.8                                                                               | 22.9                                                                                | 22.9                                                                                |                                                                                     | 9.8                                                                                 | 28.7                                                                                |                                                                                     |
| Total Split (s)         | 41.0                                                                              | 41.0                                                                              | 0.0                                                                               | 41.0                                                                              | 41.0                                                                              | 26.0                                                                              | 33.0                                                                                | 33.0                                                                                | 0.0                                                                                 | 26.0                                                                                | 59.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 41.0%                                                                             | 41.0%                                                                             | 0.0%                                                                              | 41.0%                                                                             | 41.0%                                                                             | 26.0%                                                                             | 33.0%                                                                               | 33.0%                                                                               | 0.0%                                                                                | 26.0%                                                                               | 59.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 3.0                                                                               | 3.9                                                                                 | 3.9                                                                                 |                                                                                     | 3.0                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 3.0                                                                               | 3.0                                                                               |                                                                                   | 3.0                                                                               | 3.0                                                                               | 1.0                                                                               | 1.8                                                                                 | 1.8                                                                                 |                                                                                     | 1.0                                                                                 | 1.8                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 6.0                                                                               | 6.0                                                                               | 4.0                                                                               | 5.7                                                                                 | 5.7                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 5.7                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lead                                                                              | Lag                                                                                 | Lag                                                                                 |                                                                                     | Lead                                                                                |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                               | Yes                                                                                 | Yes                                                                                 |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     |
| Recall Mode             | None                                                                              | None                                                                              |                                                                                   | None                                                                              | None                                                                              | None                                                                              | C-Min                                                                               | C-Min                                                                               |                                                                                     | None                                                                                | C-Min                                                                               |                                                                                     |
| Act Effect Green (s)    | 35.0                                                                              | 35.0                                                                              |                                                                                   | 35.0                                                                              | 35.0                                                                              | 63.0                                                                              | 27.3                                                                                | 27.3                                                                                |                                                                                     | 55.0                                                                                | 53.3                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.35                                                                              | 0.35                                                                              |                                                                                   | 0.35                                                                              | 0.35                                                                              | 0.63                                                                              | 0.27                                                                                | 0.27                                                                                |                                                                                     | 0.55                                                                                | 0.53                                                                                |                                                                                     |
| v/c Ratio               | 1.14                                                                              | 0.19                                                                              |                                                                                   | 0.57                                                                              | 0.31                                                                              | 1.01                                                                              | 0.49                                                                                | 1.02                                                                                |                                                                                     | 0.73                                                                                | 0.59                                                                                |                                                                                     |
| Control Delay           | 120.3                                                                             | 19.2                                                                              |                                                                                   | 33.1                                                                              | 25.5                                                                              | 54.8                                                                              | 56.4                                                                                | 66.4                                                                                |                                                                                     | 36.8                                                                                | 9.4                                                                                 |                                                                                     |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 |                                                                                     | 0.0                                                                                 | 0.3                                                                                 |                                                                                     |
| Total Delay             | 120.3                                                                             | 19.2                                                                              |                                                                                   | 33.1                                                                              | 25.5                                                                              | 54.8                                                                              | 56.4                                                                                | 66.4                                                                                |                                                                                     | 36.8                                                                                | 9.7                                                                                 |                                                                                     |
| LOS                     | F                                                                                 | B                                                                                 |                                                                                   | C                                                                                 | C                                                                                 | D                                                                                 | E                                                                                   | E                                                                                   |                                                                                     | D                                                                                   | A                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 98.0                                                                              |                                                                                   |                                                                                   | 46.5                                                                              |                                                                                   |                                                                                     | 66.1                                                                                |                                                                                     |                                                                                     | 14.3                                                                                |                                                                                     |
| Approach LOS            |                                                                                   | F                                                                                 |                                                                                   |                                                                                   | D                                                                                 |                                                                                   |                                                                                     | E                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | ~331                                                                              | 44                                                                                |                                                                                   | 119                                                                               | 87                                                                                | ~525                                                                              | 19                                                                                  | ~321                                                                                |                                                                                     | 132                                                                                 | 117                                                                                 |                                                                                     |
| Queue Length 95th (ft)  | #522                                                                              | 86                                                                                |                                                                                   | 201                                                                               | 145                                                                               | #808                                                                              | #64                                                                                 | #426                                                                                |                                                                                     | m#220                                                                               | 145                                                                                 |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 291                                                                               |                                                                                   |                                                                                   | 261                                                                               |                                                                                   |                                                                                    | 534                                                                                 |                                                                                     |                                                                                     | 378                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 150                                                                               |                                                                                   |                                                                                   | 110                                                                               |                                                                                   | 100                                                                               | 400                                                                                |                                                                                     |                                                                                     | 400                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 390                                                                               | 644                                                                               |                                                                                   | 406                                                                               | 604                                                                               | 835                                                                               | 72                                                                                 | 1310                                                                                |                                                                                     | 430                                                                                 | 2625                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 409                                                                                 |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 1.14                                                                              | 0.19                                                                              |                                                                                   | 0.57                                                                              | 0.31                                                                              | 1.01                                                                              | 0.49                                                                               | 1.02                                                                                |                                                                                     | 0.73                                                                                | 0.70                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 19 (19%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 70

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.14

Intersection Signal Delay: 45.7

Intersection LOS: D

Intersection Capacity Utilization 107.8%

ICU Level of Service G

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

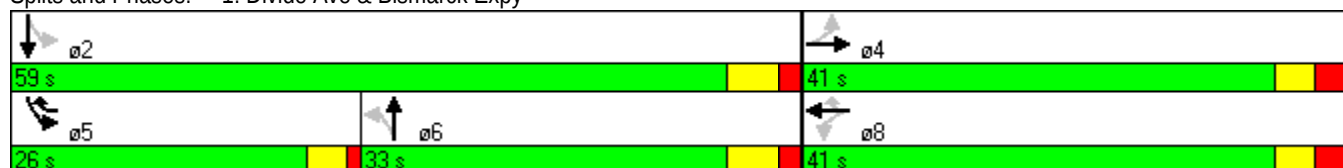
Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Divide Ave & Bismarck Expy



|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |                                                                                   |  |                                                                                   |                                                                                   |                                                                                   |                                                                                     |  |  |  |  |                                                                                     |
| Volume (vph)            | 418                                                                               | 0                                                                                 | 561                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 1862                                                                                | 182                                                                                 | 46                                                                                  | 939                                                                                 | 0                                                                                   |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 200                                                                               |                                                                                   | 200                                                                               | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                   |                                                                                     | 0                                                                                   | 222                                                                                 |                                                                                     | 0                                                                                   |
| Storage Lanes           | 2                                                                                 |                                                                                   | 2                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                   |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 300                                                                               | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                  |                                                                                     | 25                                                                                  | 150                                                                                 |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 575                                                                               |                                                                                   |                                                                                   | 383                                                                               |                                                                                   |                                                                                     | 458                                                                                 |                                                                                     |                                                                                     | 769                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 13.1                                                                              |                                                                                   |                                                                                   | 8.7                                                                               |                                                                                   |                                                                                     | 7.8                                                                                 |                                                                                     |                                                                                     | 13.1                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 3%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                  | 8%                                                                                  | 27%                                                                                 | 10%                                                                                 | 9%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 454                                                                               | 0                                                                                 | 610                                                                               | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 2024                                                                                | 198                                                                                 | 50                                                                                  | 1021                                                                                | 0                                                                                   |
| Turn Type               | custom                                                                            |                                                                                   | custom                                                                            |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     | Perm                                                                                | Perm                                                                                |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     | 6                                                                                   | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 6                                                                                   | 6                                                                                   | 2                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 6.0                                                                               |                                                                                   | 6.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 21.1                                                                              |                                                                                   | 21.1                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 23.4                                                                                | 23.4                                                                                | 21.4                                                                                | 21.4                                                                                |                                                                                     |
| Total Split (s)         | 26.0                                                                              | 0.0                                                                               | 26.0                                                                              | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 74.0                                                                                | 74.0                                                                                | 74.0                                                                                | 74.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 26.0%                                                                             | 0.0%                                                                              | 26.0%                                                                             | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                                | 74.0%                                                                               | 74.0%                                                                               | 74.0%                                                                               | 74.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.6                                                                               |                                                                                   | 3.6                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 | 3.9                                                                                 |                                                                                     |
| All-Red Time (s)        | 1.5                                                                               |                                                                                   | 1.5                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 1.5                                                                                 | 1.5                                                                                 | 1.5                                                                                 | 1.5                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 5.1                                                                               | 4.0                                                                               | 5.1                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                                 | 5.4                                                                                 | 5.4                                                                                 | 5.4                                                                                 | 5.4                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Recall Mode             | None                                                                              |                                                                                   | None                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               | C-Min                                                                               |                                                                                     |
| Act Effct Green (s)     | 18.8                                                                              |                                                                                   | 18.8                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 70.7                                                                                | 70.7                                                                                | 70.7                                                                                | 70.7                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.19                                                                              |                                                                                   | 0.19                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 0.71                                                                                | 0.71                                                                                | 0.71                                                                                | 0.71                                                                                |                                                                                     |
| v/c Ratio               | 0.71                                                                              |                                                                                   | 0.82                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 0.60                                                                                | 0.21                                                                                | 0.56                                                                                | 0.30                                                                                |                                                                                     |
| Control Delay           | 44.3                                                                              |                                                                                   | 31.0                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 4.9                                                                                 | 0.4                                                                                 | 38.9                                                                                | 4.2                                                                                 |                                                                                     |
| Queue Delay             | 0.0                                                                               |                                                                                   | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 1.2                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |
| Total Delay             | 44.3                                                                              |                                                                                   | 31.0                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 6.0                                                                                 | 0.4                                                                                 | 38.9                                                                                | 4.2                                                                                 |                                                                                     |
| LOS                     | D                                                                                 |                                                                                   | C                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                     | A                                                                                   | A                                                                                   | D                                                                                   | A                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 5.5                                                                                 |                                                                                     |                                                                                     | 5.8                                                                                 |                                                                                     |
| Approach LOS            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     | A                                                                                   |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 138                                                                               |                                                                                   | 118                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     | 124                                                                                 | 1                                                                                   | 22                                                                                  | 59                                                                                  |                                                                                     |
| Queue Length 95th (ft)  | 189                                                                               |                                                                                   | 189                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     | m121                                                                                | m0                                                                                  | #88                                                                                 | 70                                                                                  |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 495                                                                               |                                                                                   |                                                                                   | 303                                                                               |                                                                                   |                                                                                    | 378                                                                                 |                                                                                     |                                                                                     | 689                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 200                                                                               |                                                                                   | 200                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | 222                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 711                                                                               |                                                                                   | 797                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 3394                                                                                | 957                                                                                 | 89                                                                                  | 3363                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 1042                                                                                | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.64                                                                              |                                                                                   | 0.77                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 0.86                                                                                | 0.21                                                                                | 0.56                                                                                | 0.30                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 15 (15%), Referenced to phase 2:SBTL and 6:NBT, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.82

Intersection Signal Delay: 13.2

Intersection LOS: B

Intersection Capacity Utilization 58.0%

ICU Level of Service B

Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: South Ramp & Centennial Rd

|                                                                                        |                                                                                          |
|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
|  ø2 |  ø4 |
| 74 s                                                                                   | 26 s                                                                                     |
|  ø6 |                                                                                          |
| 74 s                                                                                   |                                                                                          |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |                                                                                   |                                                                                   |                                                                                   |  |                                                                                   |  |                                                                                    |  |  |                                                                                     |  |  |
| Volume (vph)            | 0                                                                                 | 0                                                                                 | 0                                                                                 | 210                                                                               | 0                                                                                 | 45                                                                                | 0                                                                                  | 1424                                                                                | 501                                                                                 | 0                                                                                   | 838                                                                                 | 233                                                                                 |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 16                                                                                | 12                                                                                | 12                                                                                | 12                                                                                 | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 0                                                                                 |                                                                                   | 0                                                                                 | 0                                                                                 |                                                                                   | 150                                                                               | 0                                                                                  |                                                                                     | 215                                                                                 | 0                                                                                   |                                                                                     | 200                                                                                 |
| Storage Lanes           | 0                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                 |                                                                                   | 1                                                                                 | 0                                                                                  |                                                                                     | 1                                                                                   | 0                                                                                   |                                                                                     | 1                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 100                                                                               | 150                                                                                |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                    |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                    | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 270                                                                               |                                                                                   |                                                                                   | 465                                                                               |                                                                                   |                                                                                    | 769                                                                                 |                                                                                     |                                                                                     | 788                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 6.1                                                                               |                                                                                   |                                                                                   | 10.6                                                                              |                                                                                   |                                                                                    | 13.1                                                                                |                                                                                     |                                                                                     | 13.4                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                               | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                               | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                | 2%                                                                                | 2%                                                                                | 12%                                                                               | 2%                                                                                | 8%                                                                                | 6%                                                                                 | 3%                                                                                  | 2%                                                                                  | 2%                                                                                  | 3%                                                                                  | 1%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                    | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 228                                                                               | 0                                                                                 | 49                                                                                | 0                                                                                  | 1548                                                                                | 545                                                                                 | 0                                                                                   | 911                                                                                 | 253                                                                                 |
| Turn Type               |                                                                                   |                                                                                   |                                                                                   | custom                                                                            |                                                                                   | custom                                                                            |                                                                                    |                                                                                     | Free                                                                                |                                                                                     |                                                                                     | Perm                                                                                |
| Protected Phases        |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |
| Permitted Phases        |                                                                                   |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 8                                                                                 |                                                                                    |                                                                                     | Free                                                                                |                                                                                     |                                                                                     | 2                                                                                   |
| Detector Phase          |                                                                                   |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 8                                                                                 |                                                                                    | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   | 2                                                                                   |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     |                                                                                   |                                                                                   |                                                                                   | 5.0                                                                               |                                                                                   | 5.0                                                                               |                                                                                    | 10.0                                                                                |                                                                                     |                                                                                     | 10.0                                                                                | 10.0                                                                                |
| Minimum Split (s)       |                                                                                   |                                                                                   |                                                                                   | 20.0                                                                              |                                                                                   | 20.0                                                                              |                                                                                    | 20.0                                                                                |                                                                                     |                                                                                     | 22.4                                                                                | 22.4                                                                                |
| Total Split (s)         | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 36.0                                                                              | 0.0                                                                               | 36.0                                                                              | 0.0                                                                                | 64.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 64.0                                                                                | 64.0                                                                                |
| Total Split (%)         | 0.0%                                                                              | 0.0%                                                                              | 0.0%                                                                              | 36.0%                                                                             | 0.0%                                                                              | 36.0%                                                                             | 0.0%                                                                               | 64.0%                                                                               | 0.0%                                                                                | 0.0%                                                                                | 64.0%                                                                               | 64.0%                                                                               |
| Yellow Time (s)         |                                                                                   |                                                                                   |                                                                                   | 3.2                                                                               |                                                                                   | 3.2                                                                               |                                                                                    | 3.9                                                                                 |                                                                                     |                                                                                     | 3.9                                                                                 | 3.9                                                                                 |
| All-Red Time (s)        |                                                                                   |                                                                                   |                                                                                   | 2.0                                                                               |                                                                                   | 2.0                                                                               |                                                                                    | 1.5                                                                                 |                                                                                     |                                                                                     | 1.5                                                                                 | 1.5                                                                                 |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 5.2                                                                               | 4.0                                                                               | 5.2                                                                               | 4.0                                                                                | 5.4                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 5.4                                                                                 | 5.4                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Recall Mode             |                                                                                   |                                                                                   |                                                                                   | None                                                                              |                                                                                   | None                                                                              |                                                                                    | C-Min                                                                               |                                                                                     |                                                                                     | C-Min                                                                               | C-Min                                                                               |
| Act Effect Green (s)    |                                                                                   |                                                                                   |                                                                                   | 17.0                                                                              |                                                                                   | 17.0                                                                              |                                                                                    | 72.4                                                                                | 100.0                                                                               |                                                                                     | 72.4                                                                                | 72.4                                                                                |
| Actuated g/C Ratio      |                                                                                   |                                                                                   |                                                                                   | 0.17                                                                              |                                                                                   | 0.17                                                                              |                                                                                    | 0.72                                                                                | 1.00                                                                                |                                                                                     | 0.72                                                                                | 0.72                                                                                |
| v/c Ratio               |                                                                                   |                                                                                   |                                                                                   | 0.74                                                                              |                                                                                   | 0.18                                                                              |                                                                                    | 0.42                                                                                | 0.34                                                                                |                                                                                     | 0.25                                                                                | 0.21                                                                                |
| Control Delay           |                                                                                   |                                                                                   |                                                                                   | 53.1                                                                              |                                                                                   | 18.1                                                                              |                                                                                    | 4.6                                                                                 | 0.5                                                                                 |                                                                                     | 5.7                                                                                 | 2.5                                                                                 |
| Queue Delay             |                                                                                   |                                                                                   |                                                                                   | 0.0                                                                               |                                                                                   | 0.0                                                                               |                                                                                    | 0.0                                                                                 | 0.0                                                                                 |                                                                                     | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             |                                                                                   |                                                                                   |                                                                                   | 53.1                                                                              |                                                                                   | 18.1                                                                              |                                                                                    | 4.6                                                                                 | 0.5                                                                                 |                                                                                     | 5.7                                                                                 | 2.5                                                                                 |
| LOS                     |                                                                                   |                                                                                   |                                                                                   | D                                                                                 |                                                                                   | B                                                                                 |                                                                                    | A                                                                                   | A                                                                                   |                                                                                     | A                                                                                   | A                                                                                   |
| Approach Delay          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | 3.6                                                                                 |                                                                                     |                                                                                     | 5.0                                                                                 |                                                                                     |
| Approach LOS            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | A                                                                                   |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |
| Queue Length 50th (ft)  |                                                                                   |                                                                                   |                                                                                   | 139                                                                               |                                                                                   | 10                                                                                |                                                                                    | 86                                                                                  | 0                                                                                   |                                                                                     | 84                                                                                  | 18                                                                                  |
| Queue Length 95th (ft)  |                                                                                   |                                                                                   |                                                                                   | 205                                                                               |                                                                                   | 39                                                                                |                                                                                    | 134                                                                                 | 0                                                                                   |                                                                                     | 113                                                                                 | m39                                                                                 |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 190                                                                               |                                                                                   |                                                                                   | 385                                                                               |                                                                                   |                                                                                    | 689                                                                                 |                                                                                     |                                                                                     | 708                                                                                 |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 150                                                                               |                                                                                    |                                                                                     | 215                                                                                 |                                                                                     |                                                                                     | 200                                                                                 |
| Base Capacity (vph)     |                                                                                   |                                                                                   |                                                                                   | 562                                                                               |                                                                                   | 482                                                                               |                                                                                    | 3648                                                                                | 1583                                                                                |                                                                                     | 3648                                                                                | 1228                                                                                |
| Starvation Cap Reductn  |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                    | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                    | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   | 0                                                                                 |                                                                                    | 0                                                                                   | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       |                                                                                   |                                                                                   |                                                                                   | 0.41                                                                              |                                                                                   | 0.10                                                                              |                                                                                    | 0.42                                                                                | 0.34                                                                                |                                                                                     | 0.25                                                                                | 0.21                                                                                |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 20 (20%), Referenced to phase 2:SBT and 6:NBT, Start of Green

Natural Cycle: 45

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.74

Intersection Signal Delay: 7.4

Intersection LOS: A

Intersection Capacity Utilization 47.0%

ICU Level of Service A

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: North Ramp & Centennial Rd



|                         |  |  |  |  |  |  |   |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |                                                                                   |  |  |  |  |                                                                                   |  |  |  |  |  |  |
| Volume (vph)            | 28                                                                                | 5                                                                                 | 170                                                                               | 236                                                                               | 2                                                                                 | 149                                                                               | 194                                                                                 | 2017                                                                                | 365                                                                                 | 51                                                                                  | 800                                                                                 | 22                                                                                  |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 0                                                                                 |                                                                                   | 200                                                                               | 200                                                                               |                                                                                   | 200                                                                               | 530                                                                                 |                                                                                     | 0                                                                                   | 215                                                                                 |                                                                                     | 150                                                                                 |
| Storage Lanes           | 0                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                 |                                                                                   | 0                                                                                 | 1                                                                                   |                                                                                     | 0                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                  |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 30                                                                                |                                                                                   |                                                                                   | 30                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 604                                                                               |                                                                                   |                                                                                   | 932                                                                               |                                                                                   |                                                                                     | 788                                                                                 |                                                                                     |                                                                                     | 1302                                                                                |                                                                                     |
| Travel Time (s)         |                                                                                   | 13.7                                                                              |                                                                                   |                                                                                   | 21.2                                                                              |                                                                                   |                                                                                     | 13.4                                                                                |                                                                                     |                                                                                     | 22.2                                                                                |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 0                                                                                 | 35                                                                                | 185                                                                               | 257                                                                               | 164                                                                               | 0                                                                                 | 211                                                                                 | 2589                                                                                | 0                                                                                   | 55                                                                                  | 894                                                                                 | 0                                                                                   |
| Turn Type               | Perm                                                                              |                                                                                   | Perm                                                                              | Perm                                                                              |                                                                                   |                                                                                   | pm+pt                                                                               |                                                                                     |                                                                                     | pm+pt                                                                               |                                                                                     |                                                                                     |
| Protected Phases        |                                                                                   | 4                                                                                 |                                                                                   |                                                                                   | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 | 8                                                                                 |                                                                                   |                                                                                   | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 4                                                                                 | 4                                                                                 | 4                                                                                 | 8                                                                                 | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               |                                                                                   | 5.0                                                                                 | 4.0                                                                                 |                                                                                     | 5.0                                                                                 | 4.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              | 20.0                                                                              |                                                                                   | 9.0                                                                                 | 20.0                                                                                |                                                                                     | 9.0                                                                                 | 20.0                                                                                |                                                                                     |
| Total Split (s)         | 30.0                                                                              | 30.0                                                                              | 30.0                                                                              | 30.0                                                                              | 30.0                                                                              | 0.0                                                                               | 17.0                                                                                | 58.0                                                                                | 0.0                                                                                 | 12.0                                                                                | 53.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 30.0%                                                                             | 30.0%                                                                             | 30.0%                                                                             | 30.0%                                                                             | 30.0%                                                                             | 0.0%                                                                              | 17.0%                                                                               | 58.0%                                                                               | 0.0%                                                                                | 12.0%                                                                               | 53.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               | 3.5                                                                               |                                                                                   | 3.5                                                                                 | 3.5                                                                                 |                                                                                     | 3.5                                                                                 | 3.5                                                                                 |                                                                                     |
| All-Red Time (s)        | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               | 0.5                                                                               |                                                                                   | 0.5                                                                                 | 0.5                                                                                 |                                                                                     | 0.5                                                                                 | 0.5                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                               | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 4.0                                                                                 |
| Lead/Lag                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Lead                                                                                | Lead                                                                                |                                                                                     | Lag                                                                                 | Lag                                                                                 |                                                                                     |
| Lead-Lag Optimize?      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Yes                                                                                 | Yes                                                                                 |                                                                                     | Yes                                                                                 | Yes                                                                                 |                                                                                     |
| Recall Mode             | None                                                                              | None                                                                              | None                                                                              | None                                                                              | None                                                                              |                                                                                   | None                                                                                | C-Min                                                                               |                                                                                     | None                                                                                | C-Min                                                                               |                                                                                     |
| Act Effect Green (s)    |                                                                                   | 22.6                                                                              | 22.6                                                                              | 22.6                                                                              | 22.6                                                                              |                                                                                   | 60.6                                                                                | 60.6                                                                                |                                                                                     | 55.8                                                                                | 54.7                                                                                |                                                                                     |
| Actuated g/C Ratio      |                                                                                   | 0.23                                                                              | 0.23                                                                              | 0.23                                                                              | 0.23                                                                              |                                                                                   | 0.61                                                                                | 0.61                                                                                |                                                                                     | 0.56                                                                                | 0.55                                                                                |                                                                                     |
| v/c Ratio               |                                                                                   | 0.11                                                                              | 0.37                                                                              | 0.83                                                                              | 0.34                                                                              |                                                                                   | 0.51                                                                                | 0.85                                                                                |                                                                                     | 0.28                                                                                | 0.32                                                                                |                                                                                     |
| Control Delay           |                                                                                   | 29.8                                                                              | 6.7                                                                               | 59.2                                                                              | 8.0                                                                               |                                                                                   | 10.2                                                                                | 15.0                                                                                |                                                                                     | 16.4                                                                                | 7.5                                                                                 |                                                                                     |
| Queue Delay             |                                                                                   | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               |                                                                                   | 0.0                                                                                 | 0.0                                                                                 |                                                                                     | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |
| Total Delay             |                                                                                   | 29.8                                                                              | 6.7                                                                               | 59.2                                                                              | 8.0                                                                               |                                                                                   | 10.2                                                                                | 15.0                                                                                |                                                                                     | 16.4                                                                                | 7.5                                                                                 |                                                                                     |
| LOS                     |                                                                                   | C                                                                                 | A                                                                                 | E                                                                                 | A                                                                                 |                                                                                   | B                                                                                   | B                                                                                   |                                                                                     | B                                                                                   | A                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 10.4                                                                              |                                                                                   |                                                                                   | 39.2                                                                              |                                                                                   |                                                                                     | 14.6                                                                                |                                                                                     |                                                                                     | 8.0                                                                                 |                                                                                     |
| Approach LOS            |                                                                                   | B                                                                                 |                                                                                   |                                                                                   | D                                                                                 |                                                                                   |                                                                                     | B                                                                                   |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |
| Queue Length 50th (ft)  |                                                                                   | 17                                                                                | 0                                                                                 | 153                                                                               | 5                                                                                 |                                                                                   | 33                                                                                  | 387                                                                                 |                                                                                     | 8                                                                                   | 58                                                                                  |                                                                                     |
| Queue Length 95th (ft)  |                                                                                   | 42                                                                                | 52                                                                                | #262                                                                              | 54                                                                                |                                                                                   | 51                                                                                  | #687                                                                                |                                                                                     | m23                                                                                 | 87                                                                                  |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 524                                                                               |                                                                                   |                                                                                   | 852                                                                               |                                                                                   |                                                                                    | 708                                                                                 |                                                                                     |                                                                                     | 1222                                                                                |                                                                                     |
| Turn Bay Length (ft)    |                                                                                   |                                                                                   | 200                                                                               | 200                                                                               |                                                                                   |                                                                                   | 530                                                                                |                                                                                     |                                                                                     | 215                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     |                                                                                   | 364                                                                               | 549                                                                               | 356                                                                               | 528                                                                               |                                                                                   | 446                                                                                | 3033                                                                                |                                                                                     | 216                                                                                 | 2778                                                                                |                                                                                     |
| Starvation Cap Reductn  |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     |                                                                                   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 |                                                                                   | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       |                                                                                   | 0.10                                                                              | 0.34                                                                              | 0.72                                                                              | 0.31                                                                              |                                                                                   | 0.47                                                                               | 0.85                                                                                |                                                                                     | 0.25                                                                                | 0.32                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 44 (44%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 70

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.85

Intersection Signal Delay: 15.3

Intersection LOS: B

Intersection Capacity Utilization 81.0%

ICU Level of Service D

Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Trenton Dr & Centennial Rd

|                                                                                        |                                                                                        |                                                                                          |
|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
|  ø1 |  ø2 |  ø4 |
| 17 s                                                                                   | 53 s                                                                                   | 30 s                                                                                     |
|  ø6 |  ø5 |  ø8 |
| 58 s                                                                                   | 12 s                                                                                   | 30 s                                                                                     |

|                         |  |  |  |  |  |  |   |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations     |  |  |  |  |  |  |  |  |  |  |  |  |
| Volume (vph)            | 149                                                                               | 459                                                                               | 387                                                                               | 235                                                                               | 189                                                                               | 46                                                                                | 252                                                                                 | 798                                                                                 | 343                                                                                 | 78                                                                                  | 534                                                                                 | 66                                                                                  |
| Ideal Flow (vphpl)      | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Lane Width (ft)         | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  | 12                                                                                  |
| Grade (%)               |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Storage Length (ft)     | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                                 |                                                                                     | 0                                                                                   | 215                                                                                 |                                                                                     | 215                                                                                 |
| Storage Lanes           | 1                                                                                 |                                                                                   | 1                                                                                 | 2                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                   |                                                                                     | 0                                                                                   | 1                                                                                   |                                                                                     | 0                                                                                   |
| Taper Length (ft)       | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                |                                                                                   | 25                                                                                | 25                                                                                  |                                                                                     | 25                                                                                  | 25                                                                                  |                                                                                     | 25                                                                                  |
| Right Turn on Red       |                                                                                   |                                                                                   | Yes                                                                               |                                                                                   |                                                                                   | Yes                                                                               |                                                                                     |                                                                                     | Yes                                                                                 |                                                                                     |                                                                                     | Yes                                                                                 |
| Link Speed (mph)        |                                                                                   | 35                                                                                |                                                                                   |                                                                                   | 35                                                                                |                                                                                   |                                                                                     | 40                                                                                  |                                                                                     |                                                                                     | 40                                                                                  |                                                                                     |
| Link Distance (ft)      |                                                                                   | 637                                                                               |                                                                                   |                                                                                   | 607                                                                               |                                                                                   |                                                                                     | 1302                                                                                |                                                                                     |                                                                                     | 516                                                                                 |                                                                                     |
| Travel Time (s)         |                                                                                   | 12.4                                                                              |                                                                                   |                                                                                   | 11.8                                                                              |                                                                                   |                                                                                     | 22.2                                                                                |                                                                                     |                                                                                     | 8.8                                                                                 |                                                                                     |
| Confl. Peds. (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Peak Hour Factor        | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Growth Factor           | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                              | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                | 100%                                                                                |
| Heavy Vehicles (%)      | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  | 2%                                                                                  |
| Bus Blockages (#/hr)    | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Parking (#/hr)          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Mid-Block Traffic (%)   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Shared Lane Traffic (%) |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Group Flow (vph)   | 162                                                                               | 499                                                                               | 421                                                                               | 255                                                                               | 205                                                                               | 50                                                                                | 274                                                                                 | 1240                                                                                | 0                                                                                   | 85                                                                                  | 652                                                                                 | 0                                                                                   |
| Turn Type               | pm+pt                                                                             |                                                                                   | Perm                                                                              | pm+pt                                                                             |                                                                                   | Perm                                                                              | pm+pt                                                                               |                                                                                     |                                                                                     | pm+pt                                                                               |                                                                                     |                                                                                     |
| Protected Phases        | 7                                                                                 | 4                                                                                 |                                                                                   | 3                                                                                 | 8                                                                                 |                                                                                   | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Permitted Phases        | 4                                                                                 |                                                                                   | 4                                                                                 | 8                                                                                 |                                                                                   | 8                                                                                 | 6                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     |                                                                                     |
| Detector Phase          | 7                                                                                 | 4                                                                                 | 4                                                                                 | 3                                                                                 | 8                                                                                 | 8                                                                                 | 1                                                                                   | 6                                                                                   |                                                                                     | 5                                                                                   | 2                                                                                   |                                                                                     |
| Switch Phase            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Minimum Initial (s)     | 4.0                                                                               | 10.0                                                                              | 10.0                                                                              | 4.0                                                                               | 10.0                                                                              | 10.0                                                                              | 4.0                                                                                 | 6.0                                                                                 |                                                                                     | 4.0                                                                                 | 6.0                                                                                 |                                                                                     |
| Minimum Split (s)       | 8.0                                                                               | 15.7                                                                              | 15.7                                                                              | 8.0                                                                               | 15.7                                                                              | 15.7                                                                              | 8.0                                                                                 | 11.5                                                                                |                                                                                     | 8.0                                                                                 | 11.5                                                                                |                                                                                     |
| Total Split (s)         | 12.0                                                                              | 33.0                                                                              | 33.0                                                                              | 12.0                                                                              | 33.0                                                                              | 33.0                                                                              | 25.0                                                                                | 43.0                                                                                | 0.0                                                                                 | 12.0                                                                                | 30.0                                                                                | 0.0                                                                                 |
| Total Split (%)         | 12.0%                                                                             | 33.0%                                                                             | 33.0%                                                                             | 12.0%                                                                             | 33.0%                                                                             | 33.0%                                                                             | 25.0%                                                                               | 43.0%                                                                               | 0.0%                                                                                | 12.0%                                                                               | 30.0%                                                                               | 0.0%                                                                                |
| Yellow Time (s)         | 3.5                                                                               | 3.9                                                                               | 3.9                                                                               | 3.5                                                                               | 3.9                                                                               | 3.9                                                                               | 3.5                                                                                 | 3.6                                                                                 |                                                                                     | 3.5                                                                                 | 3.6                                                                                 |                                                                                     |
| All-Red Time (s)        | 0.5                                                                               | 1.8                                                                               | 1.8                                                                               | 0.5                                                                               | 1.8                                                                               | 1.8                                                                               | 0.5                                                                                 | 1.9                                                                                 |                                                                                     | 0.5                                                                                 | 1.9                                                                                 |                                                                                     |
| Lost Time Adjust (s)    | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Lost Time (s)     | 4.0                                                                               | 5.7                                                                               | 5.7                                                                               | 4.0                                                                               | 5.7                                                                               | 5.7                                                                               | 4.0                                                                                 | 5.5                                                                                 | 4.0                                                                                 | 4.0                                                                                 | 5.5                                                                                 | 4.0                                                                                 |
| Lead/Lag                | Lag                                                                               | Lead                                                                              | Lead                                                                              | Lag                                                                               | Lead                                                                              | Lead                                                                              | Lag                                                                                 | Lead                                                                                |                                                                                     | Lag                                                                                 | Lead                                                                                |                                                                                     |
| Lead-Lag Optimize?      | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                               | Yes                                                                                 | Yes                                                                                 |                                                                                     | Yes                                                                                 | Yes                                                                                 |                                                                                     |
| Recall Mode             | None                                                                              | Max                                                                               | Max                                                                               | None                                                                              | Max                                                                               | Max                                                                               | None                                                                                | C-Max                                                                               |                                                                                     | None                                                                                | C-Max                                                                               |                                                                                     |
| Act Effect Green (s)    | 34.9                                                                              | 27.3                                                                              | 27.3                                                                              | 34.9                                                                              | 27.3                                                                              | 27.3                                                                              | 53.1                                                                                | 42.9                                                                                |                                                                                     | 38.1                                                                                | 29.9                                                                                |                                                                                     |
| Actuated g/C Ratio      | 0.35                                                                              | 0.27                                                                              | 0.27                                                                              | 0.35                                                                              | 0.27                                                                              | 0.27                                                                              | 0.53                                                                                | 0.43                                                                                |                                                                                     | 0.38                                                                                | 0.30                                                                                |                                                                                     |
| v/c Ratio               | 0.37                                                                              | 0.52                                                                              | 0.58                                                                              | 0.45                                                                              | 0.21                                                                              | 0.11                                                                              | 0.52                                                                                | 0.58                                                                                |                                                                                     | 0.43                                                                                | 0.43                                                                                |                                                                                     |
| Control Delay           | 24.8                                                                              | 33.1                                                                              | 7.2                                                                               | 26.7                                                                              | 28.8                                                                              | 8.6                                                                               | 10.6                                                                                | 8.6                                                                                 |                                                                                     | 29.6                                                                                | 29.1                                                                                |                                                                                     |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 |                                                                                     | 0.0                                                                                 | 0.0                                                                                 |                                                                                     |
| Total Delay             | 24.8                                                                              | 33.1                                                                              | 7.2                                                                               | 26.7                                                                              | 28.8                                                                              | 8.6                                                                               | 10.6                                                                                | 8.6                                                                                 |                                                                                     | 29.6                                                                                | 29.1                                                                                |                                                                                     |
| LOS                     | C                                                                                 | C                                                                                 | A                                                                                 | C                                                                                 | C                                                                                 | A                                                                                 | B                                                                                   | A                                                                                   |                                                                                     | C                                                                                   | C                                                                                   |                                                                                     |
| Approach Delay          |                                                                                   | 21.7                                                                              |                                                                                   |                                                                                   | 25.7                                                                              |                                                                                   |                                                                                     | 9.0                                                                                 |                                                                                     |                                                                                     | 29.1                                                                                |                                                                                     |
| Approach LOS            |                                                                                   | C                                                                                 |                                                                                   |                                                                                   | C                                                                                 |                                                                                   |                                                                                     | A                                                                                   |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |
| Queue Length 50th (ft)  | 68                                                                                | 141                                                                               | 7                                                                                 | 54                                                                                | 53                                                                                | 0                                                                                 | 28                                                                                  | 76                                                                                  |                                                                                     | 25                                                                                  | 120                                                                                 |                                                                                     |
| Queue Length 95th (ft)  | 116                                                                               | 193                                                                               | 86                                                                                | 81                                                                                | 83                                                                                | 28                                                                                | m32                                                                                 | 121                                                                                 |                                                                                     | 50                                                                                  | 162                                                                                 |                                                                                     |

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 557                                                                               |                                                                                   |                                                                                   | 527                                                                               |                                                                                   |                                                                                    | 1222                                                                                |                                                                                     |                                                                                     | 436                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                               |                                                                                   | 215                                                                               | 215                                                                                |                                                                                     |                                                                                     | 215                                                                                 |                                                                                     |                                                                                     |
| Base Capacity (vph)     | 478                                                                               | 966                                                                               | 727                                                                               | 646                                                                               | 966                                                                               | 469                                                                               | 591                                                                                | 2156                                                                                |                                                                                     | 222                                                                                 | 1511                                                                                |                                                                                     |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |                                                                                     | 0                                                                                   | 0                                                                                   |                                                                                     |
| Reduced v/c Ratio       | 0.34                                                                              | 0.52                                                                              | 0.58                                                                              | 0.39                                                                              | 0.21                                                                              | 0.11                                                                              | 0.46                                                                               | 0.58                                                                                |                                                                                     | 0.38                                                                                | 0.43                                                                                |                                                                                     |

#### Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 59 (59%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.58

Intersection Signal Delay: 18.7

Intersection LOS: B

Intersection Capacity Utilization 62.8%

ICU Level of Service B

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: Century Ave & Centennial Rd

|                                                                                        |                                                                                        |                                                                                        |                                                                                          |
|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
|  ø2  |  ø1  |  ø4  |  ø3  |
| 30 s                                                                                   | 25 s                                                                                   | 33 s                                                                                   | 12 s                                                                                     |
|  ø6 |  ø5 |  ø8 |  ø7 |
| 43 s                                                                                   | 12 s                                                                                   | 33 s                                                                                   | 12 s                                                                                     |